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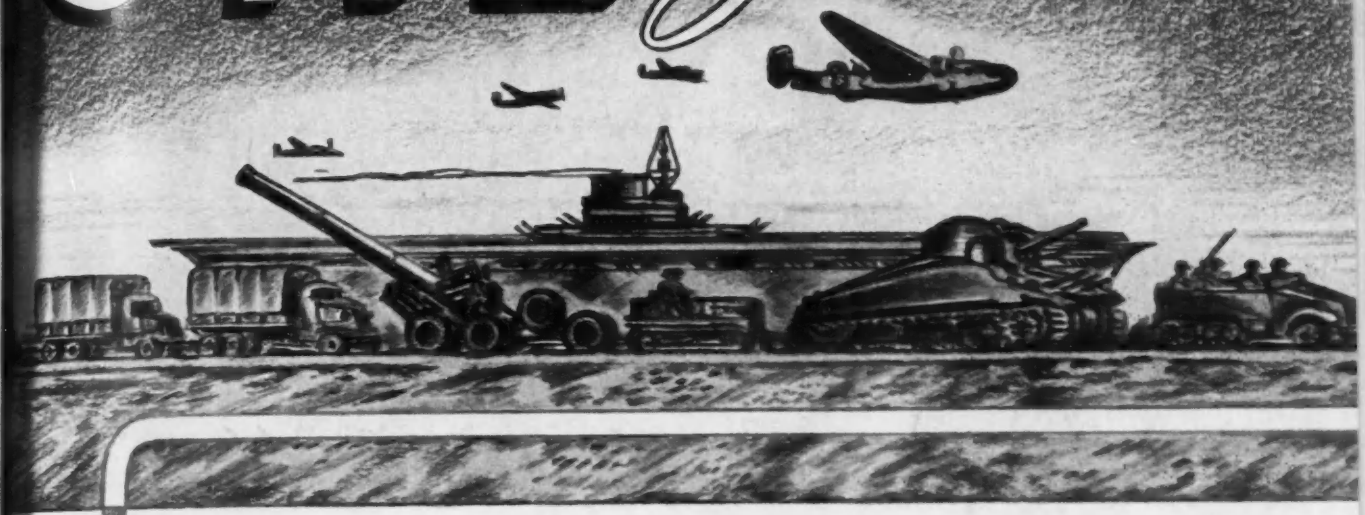
S·A·E Journal



MARCH 1944

Lessons Learned from Captured Automotive Materiel
—Major-General G. M. Barnes

Oil Aeration —R. J. S. Pigott

How Will the 100-Octane Aviation Gasoline Program Affect Post-War Motor Gasoline? —Bruce K. Brown and D. P. Barnard

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Physical Characteristics of Roughness in Internal-Combustion Engines
—Lloyd Withrow and Arthur S. Fry

SOCIETY OF AUTOMOTIVE ENGINEERS

"The Labor of a Host of Men"

A RECENT ISSUE of *Science and Appliance* carries the following quotation by Herbert Hoover: *"Discovery and inventions do not spring full grown from the brains of men. The labor of a host of men, great laboratories, long, patient, scientific experiment build up the structure of knowledge. This adding of fact to fact some day brings forth a revolutionary discovery, an illuminating hypothesis, a great generalization, or a practical invention."*

Few Americans since this war started have heard much about that group of men known as automotive engineers. But we are beginning to hear about what they *have done, are doing* . . . and we shall, in time, hear more.

Not from them. But from the *production* and *battle fronts.* That is where the results of their having added fact to fact have brought forth revolutionary discoveries NOT comforting to our enemies.

Perfect Circle is proud to work so closely with men who are serving this nation so well.

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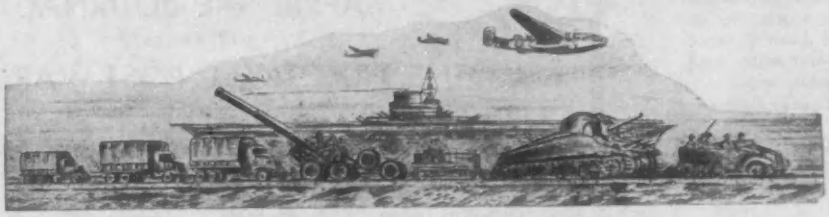

News of the **APRIL** *Issue*

By Norman G. Shidle

"On the Other Hand . . ."

"EVERYTHING in business serves sales and manufacturing . . . Next in importance are the accounting department, which keeps a record of sales and costs and of assets and liabilities, and the engineering department, which improves old products or designs new ones."

That's what Edmund T. Price, president of Solar Aircraft Co., says – and lays right on the parlor table an argument which the boys in the back room have been debating heatedly for decades.

"Without sales," Mr. Price argues, "a business is done for. Without manufacturing you have nothing to sell. Without these two together, a business just doesn't exist."

Well, just to confuse the issue a little, we'd like to add that without a designed product, there wouldn't be anything to manufacture. And without a soundly designed product there won't be many sales, even after it is well manufactured . . .

To get on best financially, Mr. Price points out, the engineer must leave his ivory tower and gain a broader comprehension of the business world – a profoundly true statement. And we'll risk a small wager that, in a company where the engineer so operates while the manufacturing manager doesn't, the engineering department won't rank fourth in importance. Nor does an industrial business thrive best whose sales and manufacturing executives fail to broaden their comprehension of the engineering world.

War Making Cabs Comfortable for Truck Drivers?

Wartime surveys of operating requirements presage post-war builder-user coordination of ideas on motor truck design details

(Mr. Price makes his case about engineers in a paper presented recently at an SAE Southern California Section meeting. A digest appears on p. 31 of this issue. A mimeographed copy of the full paper will be made available on request. For this editor's personal choice, it is the most interesting and provocative article of the year.)

FLEET OPERATORS DEMAND FUNCTIONAL DESIGNS FOR PEACETIME MOTOR TRUCKS

MOTOR trucks, which got their start in World War I, will emerge from World War II with numerous functional improvements – if the folks who operate them have any voice in the matter.

Apparently they are beginning to exercise both their lungs and their opinions, for April *SAE Journal* will present a report by Gavin Laurie, of The Atlantic Refining Co., on a survey of the desires and demands of

some 300 truck fleet operators. Reduced to their loudest common denominator, the demands of the operators boil down to something on the order of a post-war motor truck which is safe, simple, capable, easily serviced, functionally designed, and well-built.

Mr. Laurie will make no attempt to evaluate either decibels or requirements, but will report that the operators contacted want:

Cooling systems which really cool.

Accessibility of working parts to facilitate, encourage, maintenance.

Electrical systems of high quality.

Easily removed powerplants, especially in large vehicles.

Provisions for quick-starting, rapid warm-up, in cold weather.

Truck cabs comfortable and convenient for full-grown drivers, and which contribute to safety by eliminating blind spots, cramped driving positions, and untimely fatigue.

Bumpers at standardized heights, so that bumpers alone bump.

Fewer decorations, less brightwork.

Muffling of operating noises to improve truck public relations.

Design improvement to prevent tractor-semitrailer combinations from overturning in accidents.

MADE-TO-ORDER SYNTHETIC RUBBER PROVING SUPERIOR FOR AUTOMOTIVE SERVICES

SYNTHETIC rubber tires have been much in the public eye, but many other important results have come from the cooperative endeavor of rubber technicians almost overnight to match accomplishments which, in the field of natural rubber, occupied more than a century. Indications now are that, after the war, the United States will have both natural rubber and synthetic rubber tires.

Equally important is that peace will release for the satisfaction of civilian and industrial needs a large new industry equipped to produce synthetic rubber goods vastly superior to natural rubber for many purposes. Many of these special-purpose synthetics were, in fact, well established as superior automotive mechanical goods even before Pearl Harbor. Wartime developments have served to solve many of the manufacturing problems which handicapped their production.

Bright picture of the rubber future will be presented in April *SAE Journal* by P. M. Torrance, of The Firestone Tire & Rubber Co. It shows the forthcoming availability, for instance, of synthetic rubber pump seals representing an almost miraculous improvement over mechanical packings, and of synthetic rubber radiator and brake hose which will give not only better service, but facilitate the development of better cooling and braking systems.

Also in the picture are synthetic rubber windshield wipers which really keep on wiping, and synthetic rubber fan belts, motor mounts, seals, gaskets, insulators, dust covers, channel rubbers, and edgings superior to anything heretofore available.

APRIL SAE JOURNAL

will present

"THE PRACTICAL POST-WAR CAR"

by

E. C. DeSmet, of Willys-Overland Motors, Inc.

This thought-provoking dream-dispelling, down-to-brass-tacks article will establish the engineering possibilities—and *probabilities*—of America's post-war motor vehicle.

It will disclose how and why $400 plastic tear-drop cars cannot be materialized from air-brushes.

It will tell how automotive engineers, forced by economic realities to produce vehicles from proved designs and materials, will build *better* post-war cars.

The article will explain why engineering, economics, and eventualities must control post-war vehicle design.

STICKING TENDENCIES OF PISTON RINGS DISCLOSED BY NEW RESEARCH METHOD

EVER since man invented the internal-combustion engine he has been wondering what actually goes on inside it. In recent years his curiosity has been aggravated by the widening use, and especially by the expanded wartime use, of engines in airplanes. Modern planes, having great weight and high speed, require tremendous horsepower. High power output means complicated lubricating problems—all internal.

Among these complications which man never sees, but the effects of which he observes with regret, is ring-sticking. Such questions as when rings begin to stick, what makes them stick, and how to compare the abilities of various oils to prevent ring-sticking, all are in the $64 category.

Modern method of detecting ring-sticking is to observe losses in power output, increases in blowby, in oil consumption, and in cylinder temperatures. All are less definitely conclusive than disassembling the engine, but that is a time-consuming operation.

Recently developed method, still undergoing experimentation, will be described in April *SAE Journal*. It will be said to reveal both the time at which a ring begins to stick and, by measuring the actual tangential force required to move the ring in its groove, the rate at which sticking progresses. Initial tests of the method, made with a CFR L-head engine, will be reported in detail by L. W. Griffith, V. E. Yust, and M. E. Schramm, of Shell Oil Co.

They will warn that the time has not yet come to reach final conclusions. However, they will report such preliminary findings as:

- Average commercial straight mineral aircraft-engine oil produces ring-sticking in 8 to 10 hr.
- Ring-sticking time on straight mineral oil evidently is an exponential function of jacket temperature.
- Use of tetraethyl lead in fuel is an important factor.
- Results sufficiently valid to support final conclusions must await tests permitting preparation of a complete ring-sticking temperature curve.

SUCCESS OF BOMBING RAIDS OVER BERLIN ASSURED BY DRAFTING BOARD MISSIONS WHICH HEADLINES NEGLECT

THAT old song about "the man behind the man behind the gun" currently could be paraphrased to accord tuneful praise to those busy people, the research engineers, who experience neither the thrills nor the risks of bombing Berlin, but whose work is as essential as engines to taking those planes on their missions—and to bringing them back.

There is nothing particularly glamorous about their job of wheedling the last ounce of strength and erg of work from the materials in a plane, but some of the reasons why American military planes accomplish flying feats bordering upon the impossible could be traced back to them without even calling upon the imagination. In fact, when newspaper stories tell of a plane returning to base despite loss of wingtips or sections of ailerons, the untold story between the lines is that of the slide-rule fliers who successfully completed strategic drafting board missions long before that plane was manufactured.

Case in point is the research job of flutter analysis, engineering name of a neat little problem in computation involving something like 590 man-hr of work with a calculating machine and a few other instruments. It is a complicated quest of measured modes, or the shapes assumed by parts that are fluttering—at speeds around 200 mph. It calls for tabulation of mass and elastic data, formation of integrands and integrals, expanding determinantal flutter equations, solutions of polynomials in X, and, finally, plots of solution for flutter modes.

The whole story will appear in April *SAE Journal*, told by Samuel J. Loring, of Chance Vought Aircraft Division, United Aircraft Corp. In effect, this will be one of those "how to do it" articles, with equations, work sheets, and sample solutions of equations.

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The Society is not responsible for statements or opinions advanced in papers or discussions at its meetings or in articles in the JOURNAL.

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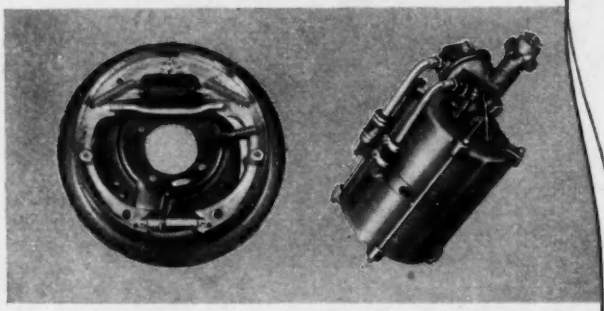
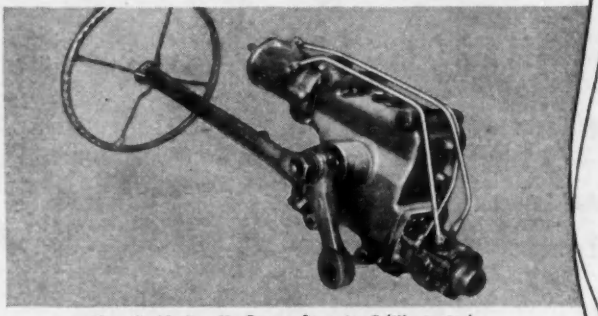
In millions of vehicles, Stromberg Carburetors contribute to better engine performance.*



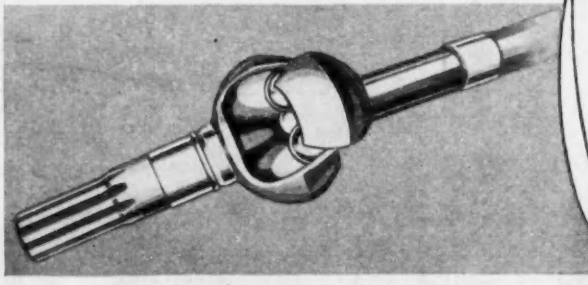
Bendix Brakes hydraulic and mechanical for safer, smoother stopping.*

Hydrovac one-unit vacuum power braking system for simpler installation and maintenance.*



Bendix Hydraulic Power Steering (illustrated in combination with Ross Steering Gear) replaces muscular effort with hydraulic control.*

Bendix Cleaner cleans automotive parts in record time.*



Bendix-Weiss constant-velocity Universal Joint for smooth power transmission.*

A Message to America's

ENGINEERS

The inventive genius of America's automotive and aviation engineers has confounded the Axis and amazed the entire world. Your leadership in providing our armed forces with new and superior weapons—planes, tanks, guns and other supplies—is helping win decisive victories on every battle front.

We here at Bendix have enjoyed working with you in adapting Bendix peacetime products to wartime uses. Like you, we also are looking forward to the day of final Victory and to the privilege of serving you even more effectively than before. Then Bendix* Brakes, Stromberg* Carburetors, Hydrovac* Vacuum Power Brake units and other battle-proved products will be again available for civilian transportation in many new applications calling for dependable performance.

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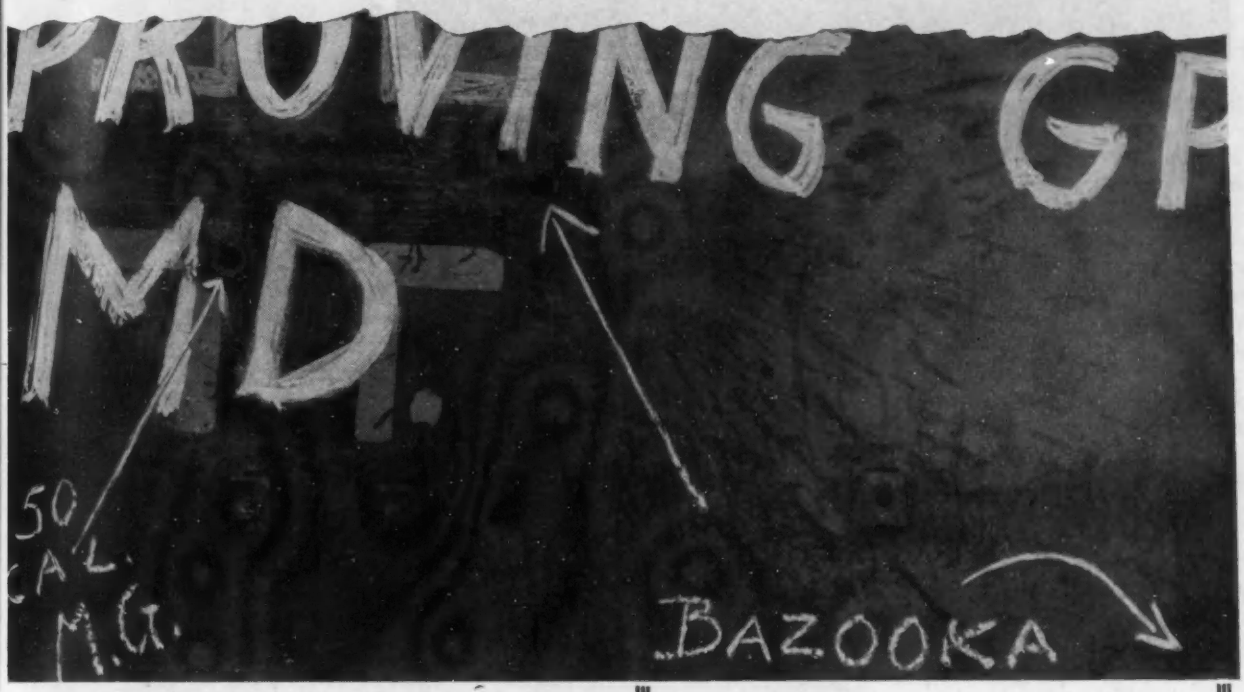
***THE INVISIBLE CREW:** Stromberg *Carburetors, Bendix* Brakes, Hydrovac* Vacuum Power Braking Systems, Bendix Hydraulic Power Steering*, and Bendix-Weiss* Universal Joints are all important members of "The Invisible Crew"—precision equipment which more than 30 Bendix plants are speeding to world battle fronts.*

** Trademark of Bendix Aviation Corporation.*

LESSONS LEARNED from CAPTURED AUTOMOTIVE MATERIEL

by MAJOR-GENERAL G. M. BARNES
Ordnance Department



Effect of Bazooka Fire

Close-up of penetrations by the Bazooka into the armor of a Mk VI German tank. One of the penetrations set fire to the tank and destroyed it on the battlefield.

"We have a collection of similar photographs in Washington," says Gen. Barnes, "showing many Mk VI tanks destroyed in Sicily by the Bazooka.

"From now on tanks employed by any army are going to have an increasingly more difficult time. Antitank guns are growing more powerful and more numerous on the battlefields. Special devices, such as the Bazooka, are being devised to defeat them.

"The tank is still an important instrument of war, however, if properly employed by a skilled commander and trained troops. Tanks provide a means of rapidly transporting high-power weapons over the battlefields and affording protection to the tankers who operate the guns."

ONE of the bright spots in the pre-war period was the close cooperation in automotive engineering between the Society of Automotive Engineers and the Ordnance Department.

Our Army must have accurate knowledge of enemy weapons, just as automotive engineers, in commercial enterprises, must have information as to competitors' products. This technical familiarity helps to remove the mystery and thus to prevent magnification of the power of enemy matériel. You may, perhaps, recall the universal awe in which this country – 2 years ago – viewed the efficiency of the German Army in its mechanized equipment. Today, this same German Army does not seem quite so powerful or mysterious. But, above all, knowledge of their war tools ensures that we will not fall behind in the race for weapon supremacy.

Our studies of foreign weapons have emphasized some of the advantages which have accrued to the enemy due to the long years of engineering preparation for war, which both the Germans and Japanese knew they would fight when they were ready. Through its long-range programs extending over 10 to 20 years our enemies have been able to prepare fully, from an ordnance standpoint, for the present war and thus are able to conduct war on a tremendous scale at a minimum of cost to these nations in raw materials and manpower.

[This paper was presented at the SAE War Engineering-Annual Meeting, Detroit, Jan. 12, 1944.]

■ Japanese Weapons

The Ordnance Department has been making an intensive study of Japanese weapons ever since our troops have been in physical contact with the enemy. Each campaign

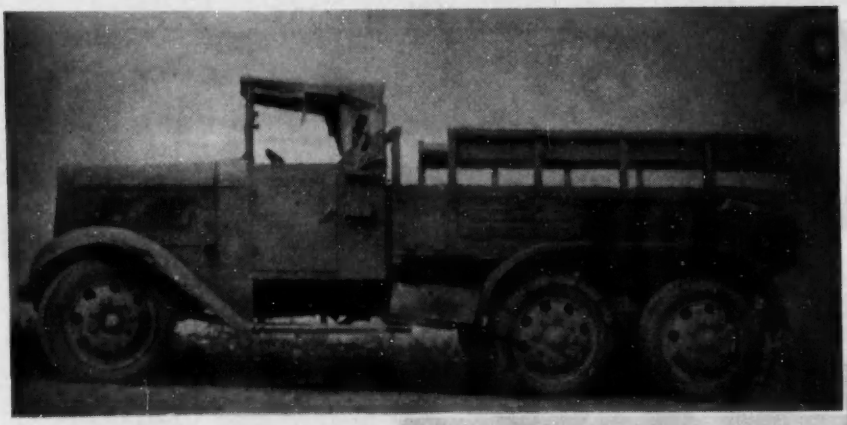


Fig. 1 (left) – Japanese 2½-ton truck

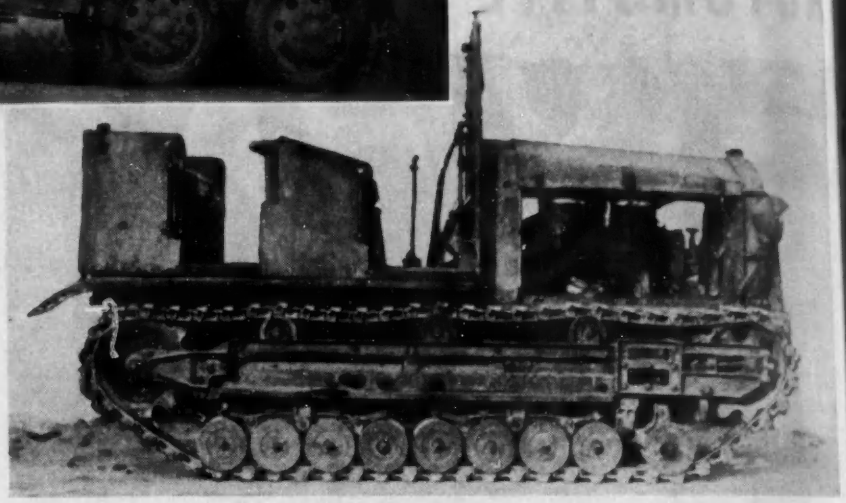


Fig. 2 (right)– Japanese light tractor

increases our stock pile of Japanese weapons and permits us to have a more thorough knowledge of the basic principles underlying their ordnance engineering. In general, we find that the Japanese have made a specialty of jungle warfare and have provided themselves with weapons primarily designed for this type of fighting. Their infantry weapons are very light and portable and can be carried into the thickest jungles; however, they lack fire power. The Japanese are not good artillerists and their artillery weapons cannot be classed as satisfactory, except perhaps for fighting under the conditions existing in the jungles.

The Japanese started this war with the caliber 25 rifle, model 38, Arisaka. In infantry fighting, this rifle has proved to be a great handicap to the Japanese when confronted with the powerful American semiautomatic shoulder rifle, M1. In the recent fighting at Tarawa, it was found that the Japanese were armed with a new rifle, caliber 303. Thus, the Japanese have had to admit that they have made a major error in the caliber of the basic weapon of the Army, the infantry rifle. If we were forced, in this country, to make such a change, we would consider it a very serious matter, since to change the caliber of ammunition of so universal a weapon would have far-reaching consequences in production, supply, and maintenance.

The Japanese are not strong in the engineering of automotive vehicles, and therefore we would not expect them to produce tanks and armored fighting vehicles of superior quality.

Japan did not produce any tanks of her own until 1929. Since then she has copied her ideas from the west. Occupying a ring-side seat in the war up to the time of Pearl Harbor, Japan was able to observe the tank developments of all nations. Her first tanks were oriental copies of the early French Renault, British Vickers, and Carden-Lloyd tanks. More recently the influence of German design can be seen. The Japanese apparently assign tanks to operations according to terrain. It is, therefore, unlikely that their heavier tanks will be seen outside of China. Although the Japanese have used some 57-mm and 75-mm guns in their tanks, their standard tank gun appears to be the 37 mm. We do not have all models of Japanese tanks at Aberdeen Proving Ground yet, but are continually increasing the number of types. We found a light tank, model 2595, in operating condition on the top of a mountain at Attu and this tank is now at Aberdeen. This Japanese light tank weighs approximately 8 tons with plates from ½ to ¾ in. in thickness. The tank is powered with a 6-cyl in-line diesel aircooled engine of sufficient power to give the tank excellent mobility and a maximum speed of approximately 25 mph. Steering is accomplished by a clutch brake system, indicating perhaps better than anything else, their lack of progressive design in tanks.

■ Japanese 2½-Ton Truck

One of the most recent vehicles to arrive at the Aberdeen Research Center is the Japanese 2½-ton truck. This truck is illustrated in Fig. 1.

The 6-cyl gasoline engine is the L-head type with tappet covers on one side. A separate external drive with flexible couplings power the generator, distributor, oil pump, and, in some cases, the water pump. Ignition, as usual, is by Bosch.

All of the tandem rear wheels are worm driven, while rotation of the differential housings are stabilized from a tubular cross member in the frame. This is a purely German design.

The wood body is provided with steel reinforcing ribs.

While at the rear, short semielliptic springs are used to cushion the shock on the pintle.

■ Japanese Tractor

The Japanese tractor is a light-weight prime mover designed for towing light artillery and transporting the gun crew of 6, as shown in Fig. 2.

It is powered by a 6-cyl in-line gasoline engine with power take-off for the worm driven winch mounted in the rear.

Eight pairs of steel-flanged bogie wheels provide undulation for the suspension.

The tracks are 10 in. wide. They are provided with holes in each link for mounting cone-shaped lugs the better to provide traction while negotiating ice or thick undergrowth. Ground contact is about 7 ft. This vehicle has a speed of 10 mph.

Giving the Japanese full credit for what they have accomplished in tank design, we must conclude that they have lacked breadth and depth of engineering talent to keep pace with American progress.

The quality margin between our weapons and the Japanese will grow wider as the war progresses. The Japanese, in the early stages of this war, due to the terrain and difficulties which we faced in spanning the great distances to the Pacific, have avoided the full impact of the American military and naval forces. As our full strength develops in the Pacific, the weight of our heavier and more powerful weapons will be increasingly felt by the Japanese and this should tend to decrease their resistance as we move relentlessly step by step into the Japanese Empire.

■ German Materiel

It is in the German Army that we find the best enemy weapons. The German nation began this scientific death struggle before the ink was dry on the Versailles Treaty. I visited Germany in 1922 and at their proving ground at Kummersdorf saw several of the new types of artillery weapons under test, in violation of the treaty.

A brief statement of the engineering features of some of the principal types of German automotive equipment follows.

■ German Half-Track Vehicles

The German Army has used the so-called half-track vehicle more extensively than has any other nation. The French were probably the first to employ the half-track vehicle in their army. There was a considerable development in France of half-track vehicles starting immediately after the first World War; however, these French vehicles were all limited to the lighter types. We started investigation of the half-track type after the last war, secured samples of the French vehicles, and undertook a program for the development of this type of vehicle.

In this war, the Germans are the leaders in the half-track field. They have produced a wide range of vehicles, from a 1-ton for use with the infantry, to the large 18-ton vehicle for hauling the heavy types of German Army artillery. There are 6 types of these vehicles: 1-ton, 3-ton, 5-ton, 8-ton, 12-ton, and 18-ton. Perhaps, more accurately, these vehicles should be called ¾-tracks, because the track has been lengthened by bringing the front drive sprocket up as close as possible to the front wheel. This has the advantage of making it nearly impossible to hang up the vehicle by ground interference with the body between the front wheel and the track.

The 1-ton German half-track vehicle is used by the Germans to carry infantry troops and also for drawing light infantry howitzers and light antitank guns.

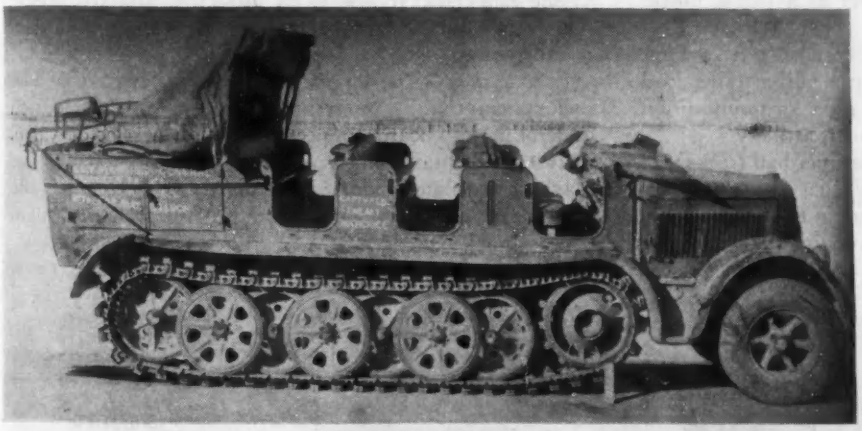


Fig. 3 (left) – German 8-ton personnel carrier and prime mover

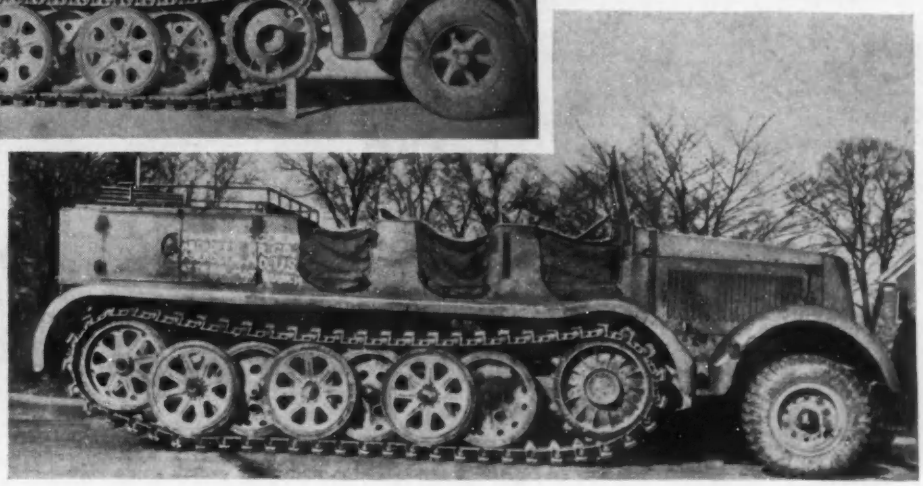


Fig. 4 (right) – German 12-ton half-track prime mover and personnel carrier

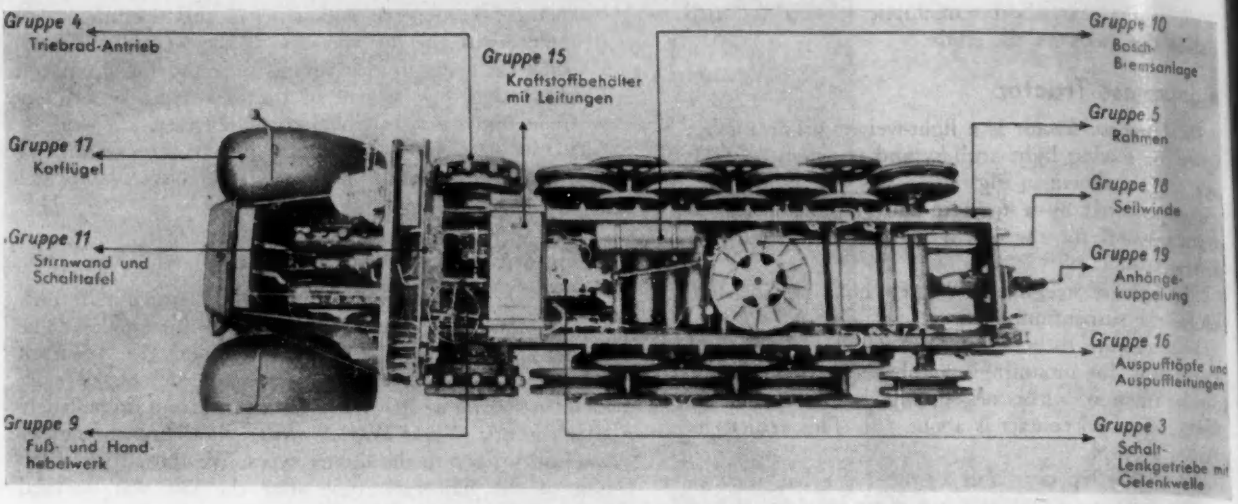


Fig. 5 – German 18-ton half-track chassis – overhead view

The 3-ton half-track vehicle is employed for drawing light field artillery. This vehicle carries a 1½-ton payload in the body and is likewise designed to haul a trailer load of 3 tons. It is also used as a chassis for mounting the 37-mm antitank and antiaircraft gun.

The 5-ton German half-track vehicle carries a payload of 1½ tons and is capable of hauling an additional trailer load of 5 tons.

The 8-ton vehicle, shown in Fig. 3, is the most universally used half-track. It is employed principally as an ammunition and troop carrier and also has been utilized for various other purposes, including mounting of certain artillery weapons. It can carry a payload of about 2 tons with an added trailer load of 8 tons.

The payload of the 12-ton half-track is 3 tons and the trailer load is 12 tons. This vehicle, shown in Fig. 4, is used for ammunition, for troops, and as a prime mover for medium corps artillery.

The 18-ton German half-track vehicle, shown in Figs. 5 and 6, carries a 4-ton payload and can pull a trailer load of 18 tons. It is likewise principally used for ammunition and as a prime mover for heavy German artillery.

Some of the main features of the German half-tracks are:

Steering – Our tests have revealed that the vehicle is steered by the combined action of turning the front wheels and braking the rear track on the inside of the turn. The steering brake drums are carried on the final drive shafts between the gear box and the driving sprockets. Operation of the brakes comes into play at 18 deg turn or approximately 2/3 full cut of the front wheels. In the full-cut position of the front wheels, it was found by experiment that the braked sprocket completed 15 revolutions to every 20 revolutions of the unbraked sprocket. The controlled differential allows all of the power to be applied to the sprockets.

Track – The track on the German half-track vehicle is the best type of track produced by the Germans. It has a cast-steel frame to which replaceable rubber pads are bolted. The track pins turn on needle roller bearings which are protected by special rubber seals. This needle-bearing track gives splendid performance with a rolling resistance of 43 lb per ton of vehicle weight. One track block is shown in Fig. 7.

The half-track vehicle is an attractive military vehicle due to the large capacity of the body for men, ammunition, or other cargo.

Fuel System – The larger of these vehicles have a dual fuel system that is interesting. A small tank is located under the dash-board connected through a selector valve. This tank contains high volatility fuel for starting the Maybach gasoline engine. Immediately after starting, the engine is capable of running on the fuel from the main tank.

Engines – Maybach engines of the 6-cyl in-line or 12-cyl

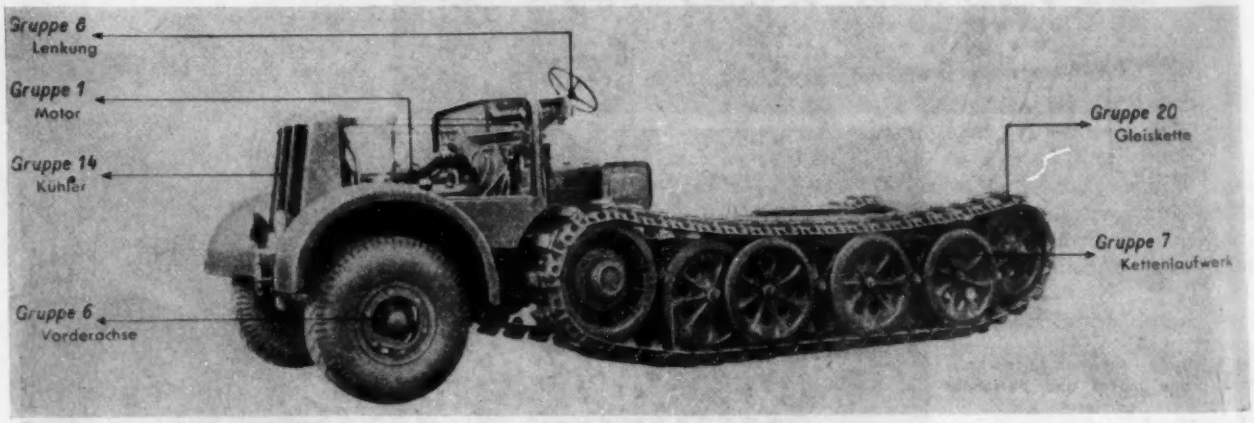


Fig. 6 – German 18-ton half-track chassis – side view

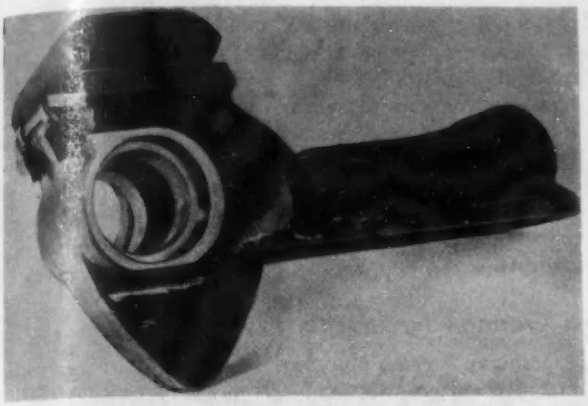


Fig. 7 – Track block from German half-track personnel carrier

V-type are used for all half-track vehicles. These engines have very flat torque characteristics with excellent fuel and oil economy, as can be seen in Fig. 8.

Starting System – The Bosch electrical system of floating armature type which engages the fly-wheel gear is employed throughout. There is also an inertia starter of the airplane type available and the third method is by hand crank.

Suspensions – The suspensions of the German half-track vehicles are very interesting. A typical design is shown in Fig. 9. You will note that the bogie wheels are mounted in pairs on a forked axle, which is attached at the end of a beam pivoted at the other end. A leaf spring supports the load. At the rear there is a trailing idler with a torsion bar suspension and means for adjusting the tension of the track. Ordnance engineers thought that this device was developed in this country at Aberdeen Proving Ground, but we find it being used in these German half-track trucks. The torsion bar suspension of the type used in the trailing idler was also under development in Aberdeen in 1932. Either we had the same ideas or the German Technical Intelligence was better than we knew at that time.

These are military vehicles engineered over many years in which the key attribute is interchangeability. A minimum number of components has been used in the construction of all 6 vehicles of this class. Thus, the engines are all the same type – Maybach 6- and 12-cyl but of suitable size for the vehicles in each series. Likewise, the tracks are basically alike. This also applies to many other features in which a component part is made to interchange and no opportunity is lost in reducing the number of spare parts.

Closely related to enemy matériel are the petroleum

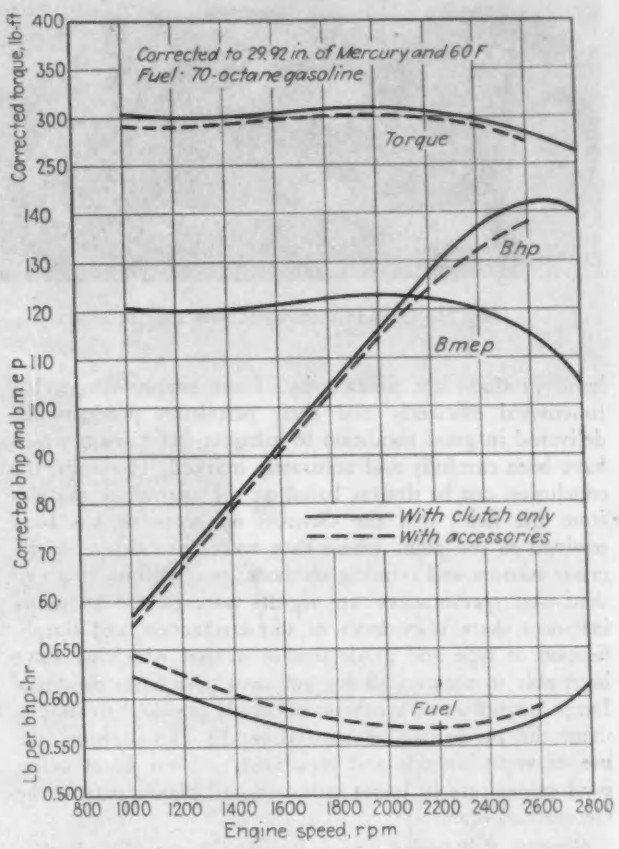


Fig. 8 – Full-load performance curves for Maybach engine from German half-track vehicle

products, which equipment requires to operate efficiently, without which it cannot operate at all. The Ordnance Department is conducting an exhaustive investigation of enemy fuels and lubricants for the purpose of determining what use can be made of captured stocks in U. S. equipment, to uncover the use of synthetic materials, methods of formulation, sources of crude, methods of refining, and to disclose changes in the products and shortages of supplies. We are most ably assisted in this work by the Coordinating Research Council, which analyzes samples of enemy fuels and lubricants collected by Ordnance Intelligence Units on all fighting fronts and furnishes us with interpretations of the data and recommendations concerning the use of the materials.

The high standards and uniformity of German petro-

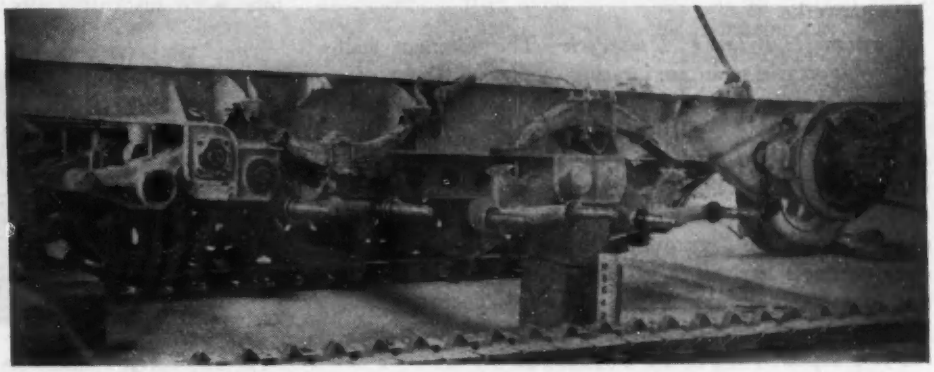


Fig. 9 – German half-track chassis – leaf springs, bogie wheel axles, and brake

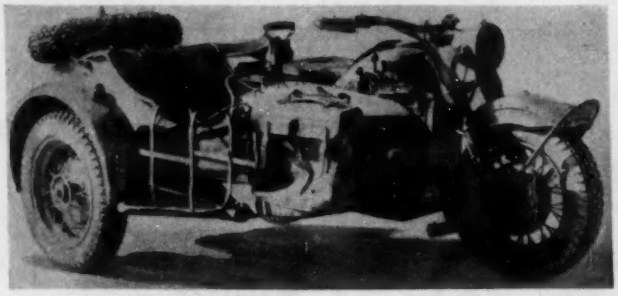


Fig. 10 – German motorcycle with side car

leum products are noteworthy. Their supply system has functioned efficiently and their petroleum products are delivered in good condition in adequate containers which have been carefully and accurately marked. However, the conclusion can be drawn, based on the analysis of samples from the field, that the German oil economy has been strained to the point where they were required to juggle crude sources and refining methods; nevertheless, it is evident that specifications are rigidly adhered to. In many instances there is evidence of standardization and simplification of type and grade similar to that which we have been able to accomplish for our own petroleum products. Large quantities of synthetic materials are used to supplement the production of natural crudes. In addition, the use of vegetable oils and reclaimed oils, the latter being used extensively in home industries, all play a part in the German oil economy.

German 8-Wheeled Drive Reconnaissance Car – Earlier in the war we heard a great deal about the German 8-wheeled armored car, especially in the African Desert. The Germans used this basic vehicle for many military purposes, principally as a light-armored, high-speed, reconnaissance car. The vehicle in its most usual form has approximately ¼ in. side armor, which affords limited protection. All eight wheels are independently driven and independently sprung, and all wheels steer. The mobility of this vehicle, while good in sand, is disappointing in mud. The Germans apparently have not found their 8-wheeler entirely up to expectations, since it has been encountered in decreasing numbers in the field in the more recent campaigns.

German Motorcycle – German motorcycles are very well-engineered in all respects. The conventional military type of motorcycle with side car (Fig. 10), drives on both of the rear wheels, thus giving the vehicle added mobility. American engineers would do well to study these features and also its attractive engine, manufactured by Bayerische Motorenwerke.

German Half-Track Motorcycle – The German half-track motorcycle is an engineering curiosity. It is a cross between a motorcycle and a half-track vehicle. The front wheel and steering mechanism of the motorcycle has been attached to a light track-laying vehicle. This unit weighs approximately 2700 lb, has a combat crew of 2 men. It is used for hauling ammunition and light towed weapons cross-country. The maximum weight is 3400 lb and it is designed for a payload of 700 lb. The vehicle has interest from a military standpoint due to its cross-country mobility, but is limited in usefulness due to the small effective carrying capacity.

German Volkswagen – An interesting type of German automotive equipment is the light-weight personnel carrier or Volkswagen. The design of this vehicle is novel to the American automotive industry, in that instead of the usual frame, automotive components are attached to a central tube, as can be seen in Fig. 11. The wheels are individually sprung using the torsion-bar type of suspension. The vehicle is 2-wheeled drive with engine in the rear. It does not compare favorably with the heavier, more rugged, 4 x 4 American jeep, with its greater cross-country mobility.

■ German Tanks

Germany overran Europe very quickly with her tanks and mechanized army and very nearly overran Africa in the same manner. Finally, these German tanks ran afoul of the American M3 and M4 Tanks at the battle of El Alamein and that phase of the dreaded German blitzkrieg had come to an end.

We now have at Aberdeen Proving Ground models of German tanks currently being used on the battlefield, and are engaged in an intensive study of these machines. These German tanks include the Panzer Kw Mk I, II, III, IV, and VI, the latter also known as the "Tiger" Tank.

The Panzer Kw I, which was modeled in 1934, was soon found to be too feeble a tank to stand the pace of modern warfare. This tank, shown in Fig. 12, weighed but 7 tons and mounted only machine guns. Likewise, the Panzer Kw II, modeled in 1936 and which, together with the Kw I, was the backbone of their armored force in 1938, is now considered too lightly armored for a fighting vehicle. It has been continued in use as a general-purpose cargo carrier and for use as the basis of certain self-propelled artillery. The Kw II was the tank which in 1939 and 1940 struck terror in the hearts of the Poles and French, as it carried flame-throwing equipment. The Panzer Kw III (Fig. 13) and IV were the principal tanks on the German battlefields of 1942 and 1943 and were the tanks which the Germans employed against the American M3 and M4. These two German tanks are very similar in characteristics and both weigh approximately the same, about 25 tons. It is interesting to note that the Germans have continued these models in use, but at the same time have constantly improved them, year by year. Starting in 1936 with both models, there have been 19 principal modifications to the Pz Kw III and 7 modifications of the Kw IV. For example, in the case of the Kw III, the tank started off with a suspension using coiled springs. A change was then made to semi-elliptic leaf spring and later in place of the two springs, three were introduced, and so on through various changes of suspension until in the fifth model the torsion bar suspension was introduced.

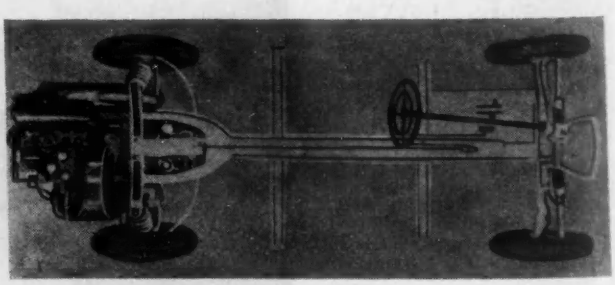


Fig. 11 – German Volkswagen chassis

Fig. 12 – German light tank Kw I

Fig. 13 – German tank Kw III

Fig. 14 – German tank Kw III with short 50-mm gun

Fig. 15 – German tank Kw V

Fig. 16 – German tank Kw VI

There was a corresponding evolution in the armament of the Kw III. At first the 37-mm tank gun was used. In 1939 the armament was changed to a 50-mm or 2-in. gun of relatively high power. Fig. 14 shows the Kw III with a short 50-mm gun. In 1942 the short barrel 75-mm gun was mounted. Also the 105-mm short-barrel howitzer was introduced into the later models. Likewise, the armament for the Kw IV tank started with a short-barrel 75-mm gun, the power of which was increased in later models. The side armor of the Kw III and IV tanks was about 8/10 in. We find that both of these principal German tanks, which were in the African theater, were deficient as to armor and armament and greatly inferior as to reliability, to the American M3 and M4 tanks, which were thrown against them. A few details of the construction of this series of German tanks may be of interest.

Engines – This entire series of German tanks was equipped with Maybach engines. Six-cyl engines of 100 and 140 hp, respectively, were used for the Pz Kw I and II tanks, and 12-cyl V-engines of 320 hp were used in the Pz Kw III, IV, and early V. V-12 engines of 650 hp were used in the Pz Kw VI.

Steering – In all of the German tanks, the epicyclic type of steering using the clutch brake principle, but without differential between the track drives was employed. This steering, while satisfactory, is not considered as good a steering mechanism as the controlled differential. As pointed out previously, the controlled differential was employed in the German half-track vehicles.

Tracks – The steel tracks used on all German tanks consist of a common type of simple pin-jointed track block. This track block is strangely similar to the steel track block employed in some American tanks up to about 1930. The Germans had an excellent needle-bearing track block for their half-track vehicles and it is difficult to understand why this superior type of track block was not employed for German tanks. Their tank track is good for approximately 600 miles and has high resistance to traction particularly at high speeds, as is the case of all tracks of this type. The Germans turned this disadvantage, in having to replace tracks frequently, into an advantage by carrying a generous supply of track shoes; and piling these tracks up at the front and along the sides of the tank to give additional armor protection.

Armor – The armor on these German Mk III and IV

concluded on p. 25

MAJOR-GEN. LEVIN H. CAMPBELL, JR., Chief of the five generals who signed the Ordnance Distinguished Service Award, opposite page, demonstrating a captured Japanese 7.7 mm aircooled machine gun. (The article beginning on p. 17 describes other captured enemy weapons)

TO INSURE PROMPT ATTENTION IN REPLYING REFER TO:

_____ NO. _____

ATTENTION OF

_____

WAR DEPARTMENT
OFFICE OF THE CHIEF OF ORDNANCE
WASHINGTON, D. C.

21 January 1944

Mr. John A. C. Warner
General Manager
Society of Automotive Engineers, Inc.
29 W. 39th St.
New York 18, New York

Dear Mr. Warner:

I am very appreciative of your letter of 20 January in which you tell me of the adoption of a resolution pledging the support of the Society of Automotive Engineers to the Ordnance Department not only during the present emergency, but during the days of peace to follow.

The Ordnance Department feels very close to the Society by reason of the long and most helpful period of association. The present state of perfection of Ordnance combat vehicles is in no small measure due to the work of the Ordnance Advisory Committee of the Society over the long period of years following World War I.

With kindest regards,

Always sincerely yours,

L. H. CAMPBELL, Jr.
Major General, Chief of Ordnance

Ordnance
Distinguished Service Award

presented to

Society of Automotive Engineers, Inc.

In recognition of outstanding and meritorious engineering advisory services in war and peace; in design, manufacture and maintenance of Ordnance matériel.

Award Authorized December 28, 1943

Ordnance Department, United States Army

W. H. Campbell Jr.
Major General, U.S. Army
Chief of Ordnance

Major General, U.S. Army
Chief, Technical Division

T. J. Hayes
Major General, U.S. Army
Chief, Industrial Division

Julian S. Hatcher
Brigadier General, U.S. Army
Chief, Field Service Division

W. R. Boothby
Brigadier General, U.S. Army
Chief, Tank-Automotive Center

UNIV. OF MICH.

MAJOR-GEN. LEVIN H. CAMPBELL, JR., Chief of the five generals who signed the Ordnance Distinguished Service Award, opposite page, demonstrating a captured Japanese 7.7 mm aircooled machine gun. (The article beginning on p. 17 describes other captured enemy weapons)

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UNIV. OF MICH.

continued from p. 23

tanks was very light, as would be indicated by the total weights of the vehicles. The Germans, however, employed face-hardened plates which were fabricated by welding. We have tested this German plate and have found it considerably below American specifications. Luckily, the Ordnance Department, from the first, had undertaken the manufacture of the more difficult capped armor-piercing ammunition for its 75-mm gun, which readily defeated the face-hardened plate of the German tanks, and the additional plates which the Germans hastily added to their tanks in a vain effort to keep out our projectiles.

The Panzer Kw V, illustrated in Fig. 15, is a new tank designed in 1939 which, to date, has been rarely seen on any battlefield. It is a larger tank than the Pz Kw IV, weighing 36 tons. It also mounts a 75-mm gun. This tank represents a redesign of the Panzer Kw IV and a step in advance of the latter. We expect to see more of these tanks in the future. It is known that the Germans have vigorously guarded the secret development of this tank. The latest modification is believed to be the German "Panther" tank, mounting a very high-velocity 75-mm gun and utilizing the engine, transmission, suspension, and tracks of the Panzer Kw VI Tank.

The German Mk VI, also referred to as the "Tiger" tank, was first encountered by the British and American Armies in the drive for Tunisia. Fig. 16 shows one of these tanks. American officers were surprised that this tank was disclosed at that time, but it was apparently due to the knowledge that their Pz Kw III and IV Tanks had been badly outclassed by the American M3 and M4 Tanks. It is quite possible that the Mk VI tank was engineered due to the fear on the part of the Germans that we would use our heavy 60-ton tank against them in Africa. The Mk VI tank is undoubtedly an effort on the part of the Germans to correct the shortcomings which had been found in their tanks through battle experience. The "Tiger" tank follows, in general, the basic German design for tanks, with engine in rear, with transmission and drive sprocket in the front. The armor used on the sides is 3¼ in. thick. The overall weight of the vehicle is 67 U. S. tons. The gun mounted in the Mk VI tanks is the German 88-mm gun, which previously was used so successfully against the British on an antiaircraft type of carriage. This gun is similar to, but is overmatched by, the American 90-mm gun, which likewise was available in Africa on an antiaircraft mounting. Perhaps one of the most interesting features of the German Mk VI tank is its ability to cross streams of considerable depth by fording. The tank is water-tight throughout and was apparently designed for crossing rivers in Russia and possibly in other theaters without the use of bridges.

■ Field Organization

The Ordnance Department obtains information concerning the equipment of our enemies through our Military Intelligence Organizations located in all neutral countries, from reports of operations against our enemies in the field, and from the study of captured enemy equipment transported home. The Ordnance Department has an extensive field organization operating with our troops on all battle fronts. Young Ordnance officers have been specially trained to accompany our fighting organizations to inspect on the battlefield all types of captured equipment and to select novel weapons to be transported to the United States for test and study. In many cases these Ordnance officers, advancing with our troops, have occupied abandoned enemy gun positions while the weapons were literally still hot from firing. Up to the present time, over 4000 tons of enemy equipment have been sent to Aberdeen. These weapons include more than 1500 separate items, principally Japanese and German. They were not secured for the purpose of setting up a museum, but for test at the proving grounds and the laboratories throughout the United States, in the same way that our own Ordnance equipment is tested. A very large number of rounds of enemy ammunition have been fired to determine muzzle velocities and ranges to enable us to verify their range tables. German artillery is being proof-tested in comparison with our own. In the case of all weapons, we are endeavoring to determine whether there are points of superiority, in order that in future design and manufacture we may surely exceed German performance. The pictures of German and Japanese weapons shown here may give an idea of the thoroughness with which these studies of the weapons of our enemies are carried out. It is our ambition to know enemy equipment so thoroughly that should the Germans, for example, change the firing pin of one of their many fuses, we will know not only that the change has been made, but the reasons which lead to this modification.

■ Conclusions

Our examination of Japanese Army equipment convinces us that Japan does not belong in the "big league." Her weapons lack fire power, and this disadvantage will prove fatal as we solve the logistic problems, and push forward step by step, pressing home our power drives.

The more we study the engineering details of German equipment, the clearer it is that this war was planned for many years – even before Hitler. One of the great advantages of this long period of ordnance engineering planning has been the reduction in the number of components required for German equipment. As illustrated by the series of half-track vehicles, a minimum number of engines are required, and many of these engines are also utilized as tank engines. The reduction of spare parts makes possible the delivery of a greater volume of weapons to the battlefields from a manpower and material standpoint and requires fewer technical troops for maintenance in the field. While Germany held this engineering edge at the beginning, she has now definitely lost this position. Again, she has underestimated the engineering flexibility of this nation. To my mind the greatest possible compliment was paid to American industry by Premier Stalin at his meeting with our President and Mr. Churchill, when he said, "Without American production the United Nations could never have won the war."

In any peacetime preparedness program for the years to follow, these lessons should prompt us to provide – through Congress – sufficient funds for the Ordnance Department to work with industry continuously to develop complete lines of special ordnance weapons with components primarily standardized for war. Thorough scientific and engineering preparation for war will ensure that the great industrial strength of our nation can be quickly mobilized when alerted by the "Pearl Harbor" of the future.

Technical IDEAS for ENGINEERS

Planning Conversion Of Warplanes to Big Cargo Ships

by **PAUL E. BURBANK**

United Air Lines Transport Corp.

▪ **Muskegon, Dec. 16**

(Excerpts from talk entitled "The Age of Cargo Flight")

CLASSIFICATIONS of cargoes which will go into the air are items of emergency for which no price is too high if the goods can be expedited, and sales tools of business in the form of sample equipments to permit selling new products simultaneously over the whole country; highly-styled merchandise; the West Coast's huge flower output; the fruit and produce items and the potential of air mail.

Planning Cargo Designs

Visioning and planning of types of aircraft are necessary to permit the realization of our cargo loads. Since Pearl Harbor, several outstanding airplanes have demonstrated their challenge for a position in the post-war world. The Douglas DC-3 carries a payload of 21 passengers plus considerable cargo. The Douglas C-54 will carry 50 passengers, express and mail at a cruising speed of 220 mph, making its trips from coast to coast in approximately 12 hr. Also successfully flown is Lockheed's Constellation, which may well go into service with only a single stop transcontinentally and with a routine schedule operation of possibly 10 hr.

Then, there are the Kaiser-Hughes plane which weighs over 200 tons and will carry 60 tons of cargo, and other prospective airplanes described as capable of spanning the Atlantic in a few hours. The determining factor of big airplanes will be their economic characteristics, and unless there is a demonstration that they can lower ton-mile costs their use will be limited to only long haul and probably over-water routes.

Frequently we are asked what types of planes we anticipate in the immediate peace period. It is generally agreed that salvaged bombers will be of little commercial value because they are of heavy construction for protection from enemy fire, and can carry only unprofitable loads from a commercial standpoint.

Rather we are thinking in terms of airplanes designed for airline use. The largest of four types of such airliners would be a 4-engined, 63½-ton, 100-passenger transport with a cruising speed of 266 mph, which could with one stop fly transcontinentally in less than 11 hr. Next in size would be another 4-engined plane of 40 ton gross whose speed would be only 6 mph less than its larger companion, but would carry 75 passengers and have more flexibility for shorter haul. Airplane three would have two engines, weigh 21½ tons and, capable of carrying cargo or passengers, could be used at a cruising speed of 212 mph. If used entirely for passengers, its maximum load would be 52; for cargo, it would permit a payload of over seven tons. This airplane should be flexible enough through a system of movable bulkheads to allow fluctuation in the proportions of passenger and cargo space in carrying combination loads. The fourth type would be devoted solely to cargo and have no passenger possibilities. Of over 16 tons gross, it would be capable of carrying materials on feeder service routes or on short haul mainline routes in excess of five tons at 210 mph.

■ ■ ■

• • • briefed from paper

$1000 PLANES

ALTHOUGH wartime developments have not been concerned with the private airplane, the explosive rate at which the aircraft industry has progressed has brought to light many improvements that will be applied to the private airplane after the war.

Considerable publicity has been given the recent advances of the helicopter, however, I feel that it is still a long way from offering the best compromise, from the standpoint of the private owner, and that the fixed-wing type will dominate the immediate future.

The following types of airplanes, at least, will be offered to the post-war public:

1. A low-powered, inexpensive training type, with either tandem or side-by-side seating arrangement, which will be a refined version of the pre-war light airplane models. This plane will sell at approximately $1000 and will consist of the minimum amount of aircraft that will fly satisfactorily.

2. A medium-priced, medium-performance type, which will be supersafe, will be available in two-place and four- or five-place models. The two-place version will list at about $1500 and the larger ships at about $3000.

The performance of this type will be compromised to some extent to obtain maximum safety and comfort. As the development and tooling costs are amortized, the price will move downward, but probably will not reach the desirable $1000 level for the two-place plane or the $2000 level for the larger ships for some time.

3. An airplane combining as high performance as consistent with reasonable safety, comfort, and cost will be available at about

PERFORMANCE REPORTS AID AIR SERVICE MAINTENANCE

by **MAJOR-GEN. CLEMENTS McMULLEN**

Air Service Command

Paterson Field, Fairfield, Ohio

▪ **Metropolitan, Jan. 6**

(Excerpts from paper entitled "Design of Aircraft and Its Related Accessories from a Maintenance Viewpoint")

THE Air Service Command divides aircraft maintenance into four headings: aircraft, engines, accessories, and associated equipment.

To promote interest in submitting reports of unsatisfactory performance on our flying equipment, the Air Service Command is continually contacting operating air force units for such information. In the case of such reports on aircraft parts, I have itemized some data on those parts which need attention.

Landing gear structure accounts for 25% and wheels and brakes for 9% of our unsatisfactory reports, a large proportion of which are on heavy bombers, and a small part on trainer type planes. They also apply mostly to operation within the United States. Outside of structural failure of the landing gear frame, which may be caused by amateurs misjudging the nearness of the ground,

Papers Given at SAE MEETINGS • • •

ay Make Cloudhopping opular Sport for Two

by **WILLIAM D. HALL**
Aeronca Aircraft Corp.

▪ *1944 Annual Meeting*

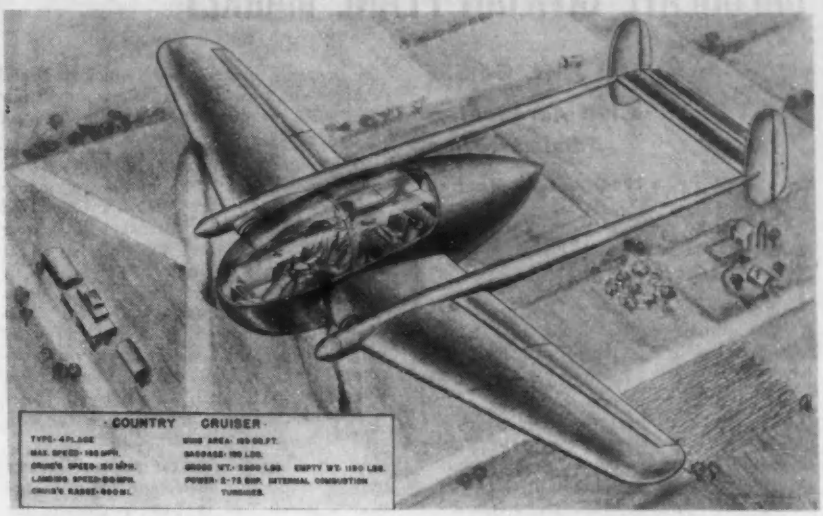
(Excerpts from a paper entitled "The Post-War Private Airplane")

$2000. This plane will be a cleaned up version of the pre-war two-place, side-by-side, low-wing, retractible gear type, and will be offered for those demanding maximum performance.

Safety – Nonspinning characteristics of the future will probably be accomplished as they were in the past: The wing proper will be designed so that it stalls gradually, with the stall originating over the center of the wing, and the ailerons used will not stall the remainder of the wing when they are deflected to obtain lateral control. Further longitudinal control will be limited so that it will be impossible to place the airplane in a complete stall position without a dive and violent pull-up. An automatic warning of the impending stall, in the form of tail buffeting or perhaps an instrument on the dashboard will be included.

The individual who takes up flying finds it very difficult to coordinate the use of the rudder and ailerons. Considerable progress toward the answer to this problem was made immediately before the war, in a ship that had the two controls interconnected so that the airplane automatically made the correct turns. A modified form of this system is sure to appear on some of the post-war private airplanes.

We expect to have a much larger number of airplanes in use after the war, so that visibility will have to be improved, to prevent serious accidents.



▪ **Fig. 1 – Sketch of a post-war, 4-place, private airplane suggested by the author**

The tricycle landing gear will make it possible for roadable-type aircraft to become available for persons willing to sacrifice performance and cost for this additional feature.

Cost – Our post-war aircraft will be designed with the initial cost controlled as rigidly as other factors have been; and aircraft models will be carried over from year to year, with minor changes, to amortize development and tooling costs.

Heretofore, the big disadvantage in owning a plane has been the upkeep. We anticipate that the indirect costs will be decreased considerably in the post-war period, since there is some talk of hangars with $5 to $8 monthly rentals, and when safer aircraft are built, insurance rates will decrease.

It must be realized, however, that, except in isolated cases, the aircraft owned by the private individual will be a semi- if not a complete luxury.

Performance – Spectacular increases in performance will be had only at a considerable additional cost; but honest cruising speeds of 100-120 mph in the lower-priced models will be a reality, with perhaps 120-140 mph for the higher-priced models. Landing and take-off speeds of 40-50 mph will be necessary to allow the higher cruising speeds, unless additional cost, in the form of complicated high-lift devices and additional power is satisfactory.

Comfort – There is room for improvement in the comfort of the pre-war private plane. Studies of exhaust muffling, vibration, soundproofing, air conditioning, and seat construction will be made so that the post-war plane will be as comfortable and pleasant to ride in as the family car.

The main difficulty in obtaining comfort is in obtaining sufficient room.

Fig. 1 shows a bit of the spare-time

turn to p. 56

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the most common failure is in the piston and cylinder of the oleo strut. This is caused largely by poor hydraulic fluid, poor packing glands or abrasion of the piston or cylinder, and by airdrome dust. The exposure of these microfinished parts to dust could be eliminated by properly sheathing them, or by placing them as far from the ground as the structure will permit.

Fuselage nacelles and engine mounts account for 17% of our difficulties. These are generally due to design deficiencies which all show up on one model and are immediately corrected. Wings, control surfaces, and horizontal and vertical stabilizers comprise 27% of our difficulties, which are similar to fuselage structure failure with two exceptions: reworking control surfaces which are covered with fabric, and the difficulty experienced with wooden wings when such equipment is operated in hot, dry climate.

A most important feature which has been overlooked by aircraft designers is the matter of heating aircraft. Probably 70% of our fuel, after burning, is wasted by radiation or exhaust.

Only 5% of our unsatisfactory reports are on the engine cowl, but the fact that these parts come off and go on in such a cumbersome manner has caused us to have airplanes on the ground for unending time.

All who deal with engines know that our big bugaboo is in the combustion chamber. Pistons and rings contributed to 26% of our failures, and cylinders 14%. Of the piston and ring failures, 38% were attributable to design, 10% to material, and 14% to manufacture. Similarly, 31% of the cylinder failures are due to poor design, 6% to material, and 12% to manufacture, the balance of the failures in each case being chargeable to operation and maintenance. Two of the major causes of malfunctioning in this category, over which the designer has no control, are poor quality of fuel and lack of proper air filters. Our experience indicates that damp cleaners are much more efficient than dry ones. However, to be effective and aerodynamically efficient, these cleaners must be designed along with the aircraft.

We have had an unending amount of trouble with corrosion, particularly in the combustion chamber.

Only 8% of our failures are due to the crankshaft, but we place 96% of that total against design, all other failures being the result of running out of oil or other maintenance or operational mistakes. Failures of blower section include damage to impellers caused by foreign substances being introduced into the engine induction system. Failures in the accessories section are attributable to both gear and bearing failures. In the category of cam drive failures, we have charged only 13% to design, and about 40% to manufacture.

With reference to accessories, which includes all instruments indicating performance of the airplane or engine and also starters and generators, our greatest problem is the lack of interchangeability of component parts.

FIGURES SOAR AS PROGNOSTICATORS CALCULATE CIVILIAN PLANE MARKET

by J. H. GEISSE

Civil Aeronautics Administration

▪ 1944 Annual Meeting

(Excerpts from a paper entitled "Post-War Private Flying")

THERE are approximately 4,500,000 persons in direct contact with flying, either in the military services or in the aircraft industry, and it is expected that they will have more than an average interest in taking up flying.

In using income distribution for estimating personal airplane sales, it is customary to assume that only those with an income of $5000 or above could afford a personal airplane. This would provide a possible market for close to 2,000,000 airplanes. However, the mistake is not infrequently made of confusing annual sales of new airplanes with the total number of airplanes which may be in use. If it is assumed that those having incomes above $5000 represent the market for new airplanes and they would buy a new plane every two years, the possible annual market would then be for about 1,000,000 airplanes. If it is assumed that only those with incomes of $5000 or better will own all airplanes whether new or second-hand, then the total number which could be in use at any one time would be 2,000,000 and with the life of the airplane assumed to be eight years this would provide a market for 250,000 airplanes per year.

Statistics on the past travel habits of the people are also used by some to forecast aviation future, both in scheduled air transport and in personal air transport. In such estimates it is customary to assume that all or some portion of previous travel by other means of transportation can be diverted to air travel. This would be as valuable as estimates of the number of telephones required based on the number of letters people had written prior to the introduction of the telephone.

In 1940 I made a study of the continuity of private airplane ownership. Assuming an airplane life of eight years, with a mean period of ownership of less than four years, then each owner consumed only one-half an airplane in his lifetime. For comparison it can be assumed that each automobile owner consumes about four automobiles in his lifetime. Hence, for the same registration of automobiles and airplanes one would have to get eight times as many new customers as the automobile salesman. That makes sales costs all but prohibitive.

A study was also made of student and pilot certifications. Only 15% of those taking out student certificates continued to secure private pilot certificates. Results showed that 28% of them intended to fly commercially, about 37% wanted to fly for pleasure, 13% desired the airplane for pleasure transportation, and only 7% desired it for business transportation.

Among the reasons for discontinuing flying, expense greater than anticipated and change in financial status accounted for over 50% of the total. Next in order of importance was inaccessibility of airports.

What kind of personal airplane is the public going to get? A number of manufacturers are convinced that they can find a good market for the airplane they were producing before the war the first year after the war, with minor changes. Of 13 manufacturers who indicated an intention of entering the personal airplane field, seven are planning on offering "safety" airplanes and three more are considering offering helicopters. This indication of the trend toward subordination of high speed to other desirable characteristics is the most hopeful sign of a healthy post-war market.

In an effort to give the airplane greater utility, several are developing roadable airplanes, which will in part compensate for the inaccessibility of airports and for weather interruptions. Another answer to the lack of utility is a drive-it-yourself, fly-it-yourself system where an airplane could be rented at any airport and turned in at any other airport. Several manufacturers are also contemplating offering a family airplane – 4- to 5-place – and estimates of prices range from $2500 for a single-engine ship to $5000 for a twin-engine job.

Discussion

TAKING issue with the claim of Mr. Geisse that flying is being retarded because of costs, Waldo Waterman, Stout Research Division, said he believed the main factor is a lack of utility. Safety considerations are important, but they have already been stressed. More emphasis must now be placed on designing the aircraft for greater usefulness – and thus, more cost can be justified.

Public interest in flying will be throttled, however, if CAA regulations aren't revised to decrease the amount of red tape required, Mr. Waterman also contended. Much of this regulation, Mr. Geisse answered, was requested by the industry, itself.

A. L. Hapke, Republic Aviation Corp., quoting figures from memory, explained that in 1940 only about 40% of the planes flying were operated by individuals, and of this per cent one-half derived some income from the use of their plane; therefore, only about 20% paid all expenses and got no income back – which changes the picture presented by the author, who did not take into account the receipt of such income.

Only private owners having one plane, who said they did no commercial flying were included in his figures, Mr. Geisse replied. As to making extra money, he said that a law to prohibit this activity without a certificate might soon be passed.

Frank Spring, Hudson Motor Car Co., gave some interesting figures on his 25 years of flying planes in the 4- and 5-place category. Including all costs, he paid $30 per hour to fly.

A rather different story of flying costs was told by A. R. Lambert, Stimson Aircraft Division, who is the member of a flying club. Hangar costs and dues totaled $3.75 per month for each member. Flying time cost $2.00 per hr. These figures include insurance.

Robert Insley, Continental Motors Corp., wondered about navigation for the average person. Mr. Geisse said that a pilot is required to pass an examination in meteorology, and, as far as navigation is concerned, the average pilot picks this up as he increases the distance he flies from his home field.

A suggestion from Herb Packer, *Motor Service Magazine*, that all highways have numbers marked on them and all towns be labeled, was improved upon by Mr. Geisse, who said that if towns had their latitude and longitude clearly marked, navigation would really be simple. Then no maps would be needed for a pilot to figure how far he had gone and how much farther he had to go.

Technical IDEAS for ENGINEERS

SYNTHETIC Rubber Hopes

THE existence of synthetic rubbers is not wholly a matter of emergency materials, declared L. R. Davis, U. S. Rubber Co., at the New England Section meeting Jan. 11, where he discussed "The Rubber Problem – Present and Future," but rather should be regarded as auxiliary materials that have extended the horizon of all industry.

These elastic plastics, which have their own peculiar characteristics, have many unexplored uses, he said, and the rubber industry has done as much with them in 30 months as was done with natural rubber in 30 years. He predicted that automotive progress especially will be tied to these materials. Although no substitute has been found for rubber in the case of tires as yet, Mr. Davis stated that a synthetic tire has been produced which will render satisfactory service at 35 mph and do it for 15-18,000 miles.

The nearest duplicate to natural rubber that has been developed, he said, and one that is found in this country in great quantities, is GR-S or Buna S – composed of butadiene, which comes from alcohol or crude oil, and styrene, which comes from coal tar. The two oil-like ingredients together in proper quantities, a catalyst to speed up the polymerization, and a new chemical known as a softener or modifier, is in the main the whole trick of making Buna S, asserted Mr. Davis. He emphasized the fact that daily progress is being made to improve other synthetic rubbers which are still in an embryonic state, but which will have a definite place in the post-war world.

NEW YARDSTICKS Measure Diesel Fuel Qualities

by C. C. MOORE and B. T. ANDERSON
Union Oil Co. of Calif.

▪ Southern California, Jan. 28

(Excerpts from paper entitled "Diesel Fuels – A Review of Present Knowledge")

FUEL cleanliness and freedom from water are equally important to the proper operation of both the large slow speed marine engine and the small high speed truck engine, but the marine installations are generally equipped with both efficient centrifuge and filtering systems which insure the delivery of clean fuel to the injectors. In the case of the high speed diesel engine only filtration of the fuel is feasible, and the supplier must therefore use extra precautions to provide a clean, dry fuel for this type of engine.

Higher ignition quality is the second requirement of the high speed diesel engine. In an effort to avoid too great confusion in testing methods, the ASTM-CFR procedure for the determination of ignition quality of diesel fuels was developed. This method evaluates an unknown fuel in terms of cetane number. This rating is equivalent to the numerical percentage of cetane (a 16 carbon atom straight chain paraffinic hydrocarbon which has exceptionally good ignition quality) in alphamethyl-naphthalene (a material which ordinarily will not ignite in a diesel engine).

Our present knowledge of the significance of ignition quality as expressed by cetane number is as follows:

1. Each engine has a minimum cetane number requirement below which it will not start. This minimum requirement varies for an individual engine with starting temperature, altitude, and engine condition.

2. At least to a limited extent, ease of starting and smoothness of engine operation are functions of the cetane number of the fuel.

3. Other characteristics of the fuels being similar, the higher the cetane number the less the exhaust smoke and the sweeter the exhaust odor.

The third difference in fuel requirements of high speed and slow speed diesel engines is in distillation characteristics, which include the correlated functions of viscosity and atomization. It is mandatory in any combustion process, whether it be burning oil under a boiler or diesel fuel in a compression-ignition engine, that vaporization of the fuel be accomplished before the liquid particles strike a solid surface. In the diesel engine, vaporization of the fuel is achieved by injection of the fuel into the combustion chamber at very high velocity through extremely small orifices. In a 4000-hp, 6-cyl marine engine of 30-in. bore the distances across the combustion chamber are great and there is plenty of room for a long spray pattern. As a result, the engine is not too

turn to next page

Properties of Natural and Synthetic Rubbers Compared

Properties Important in Processing:	NATURAL RUBBER	BUNA S TYPE	BUNA N TYPES	NEOPRENE TYPES	BUTYL TYPE	THIOKOL POLYSULFIDE TYPES
Form in which available:	Latex and Solid Forms	Latex and Solid Forms	Latex and Solid Forms	Latex and Solid Forms	Solid Form	Dispersion, Solid & Powder Forms
Breakdown	Very Good	Good	Fair	Good–V.G.	None	Slow
Plasticity Range after Breakdown	High–Low	High–Low	High–Medium	High–Low	Medium	High–Low
Building Tack and Cohesion	Excellent	Fair	Fair	Very Good	Good	Fair–Good
Vulcanizability	Very Good	Very Good	Very Good	Very Good	Fair–Good	Fair
General Processability	Very Good	Good	Fair	Good	Fair	Fair
Properties Important in Application:						
Physical Properties						
Extensibility	Excellent	Good	Good	Excellent	Excellent	Good
Resilience	Excellent	Good	Fair–Good	Very Good	Low	Good
Tensile	Excellent	Fair–Good	Good	Very Good	Good	Fair
Electrical Properties	Excellent	Excellent	Fair	Fair	Excellent	Fair
Impermeability to Gases	Good	Good	Good	Very Good	Excellent	Excellent
Impermeability to Water	Good–Very Good	Fair–Good	Fair–Good	Fair–Good	Very Good	Very Good
Resistance to:						
Plastic Flow	Very Good	Good	Good	Good	Fair–Good	Low
Abrasion	Very Good	Good–Very Good	Good–Very Good	Very Good	Fair	Low
Tear	Very Good	Fair–Good	Fair–Good	Good	Fair–V.G.	Fair–Good
Heat	Good	Fair–Very Good	Fair–Very Good	Very Good	Fair	Low
Cold	Very Good	Very Good	Fair–Good	Fair–V.G.	Good	Fair–Good
Chemical Properties						
Resistance to:						
Air	Fair	Good	Good	Excellent	Excellent	Excellent
Ozone	Inadequate	Inadequate	Fair	Excellent	Excellent	Excellent
Light	Fair	Fair	Low	Excellent	Excellent	Excellent
Petroleum	Low	Low	Excellent	Good	Low	Excellent
Aromatic Oils	Inadequate	Inadequate	Fair	Low	Inadequate	Excellent

Note: This chart covers only generalized types of synthetic rubber. The information given should not be used in specifying materials. Individual properties may be developed by special compounding, as suggested by the ranges shown in the table. Definite recommendations as to type should be left to the manufacturer. Table compiled March 1943

critical of the atomizing characteristics of the fuel and will operate satisfactorily on fuels covering a relatively wide range of viscosities. By contrast, a 150-hp, 6-cyl truck engine of 4⅞ in. bore offers a very limited distance for the individual oil particle to travel before striking a relatively cold surface, and therefore requires an oil of comparatively low viscosity which will atomize in a very short spray pattern. However, the viscosity should not be too low. For most high-speed diesel-engine injection systems a fuel having a minimum viscosity of 34 or 35 sec Saybolt Universal at 100 F is required for safety. Use of lower viscosity oils will result in rapid wear of moving parts and possible seizure and failure of parts.

In the consideration of distillation characteristics we are bound by the two practical limitations that too low a boiling range will result in part failure within the fuel injection system, and too high a boiling range will result in incomplete combustion of the fuel. A report of the CFRC to study the relationship between various individual fuel characteristics and engine deposits shows the approximate correlation of 90% distillation point and end point of diesel fuels with engine deposits. On the basis of these data the Committee recommended that the 90% point and end point of diesel fuels be held to a maximum of 650 F and 700 F respectively.

It appears evident that the straight distilled diesel fuels which we have used in the past are going to have to give way to cracked diesel fuels in the future. First, however, their quality must be improved and this must be accomplished with the least possible increase in cost.

Discussion

MR. ANDERSON, who delivered the paper, asserted that a fuel giving a clear exhaust with engine output at or below its rated horsepower will begin to produce smoke when increasing engine output above its rated horsepower, particularly with fuels in the higher boiling range.

A resolution was recently passed, said Fred C. Patton, manager of Los Angeles Motor Coach Lines, at a meeting of the California State highway officers asking for legislation of the diesel smoke problem as part of the State safety code.

Experiments have shown, declared Clyde Tattman of Cummins Engine Co., that advancing injection as cetane drops improves the smoke problem. He suggested the possibility of developing an adjustable cetane selector along the line of the octane selector used on some spark engines.

The speaker, who explained that between the time of injection and when combustion occurs, overheating may result in the same manner that a retarded spark causes overheating in spark engines, went on to say that much progress has been made in the use of additives to improve cetane and other fuel characteristics. "However," he said, "much remains to be done because of the lack of stability of present additives which will have to be improved."

When asked if fuel additives conflict with those used in engine oil, Mr. Moore, who served as technical chairman, replied that there is no conflict, because before an additive can be considered usable it must mix without ill effects with all additives now in common use in compounding additive engine oils.

SELECT CUTTING OIL TO SUIT TOOLS AND MATERIALS FOR MACHINING JOBS

by H. L. MOIR, J. S. YULE, D. J. WANGELIN, and R. G. MOYER
The Pure Oil Co.

■ **1944 Annual Meeting**

(Excerpts from a paper entitled "A Laboratory Method of Evaluating Cutting Oils")

TO have a method of selecting proper cutting oils for various machining operations with different materials, it is convenient to have a means of comparing machinability with oils of different kinds.

Tool life tests have been used for dry machinability testing by various investigators, and have proved very successful. Tool life is the length of time that the tool will cut efficiently, and is usually coincident with the breakdown of the cutting edge. Since high speeds are used, tool failure occurs abruptly.

Previous Methods

Attempts have been made to evaluate cutting oils by comparing results of tool life tests for oil and dry cutting. Comparison is made on the basis of per cent increase in cutting speed for a given tool life or per cent increase in tool life at a given cutting speed. It has been found that results obtained in these tests cannot always be correlated with field results, and it is thought that the discrepancy lies in the type of tool failure used. In the field, tools are usually reground when the finish becomes poor, which may be long before complete tool failure. We have found that the relation between usable finish and tool life is not the same for all oils. For example, two oils may produce the same tool life at a given cutting speed, but the finish life for one oil may be considerably longer than for the other oil. We have devised a test that rates oils according to finish life as well as tool life.

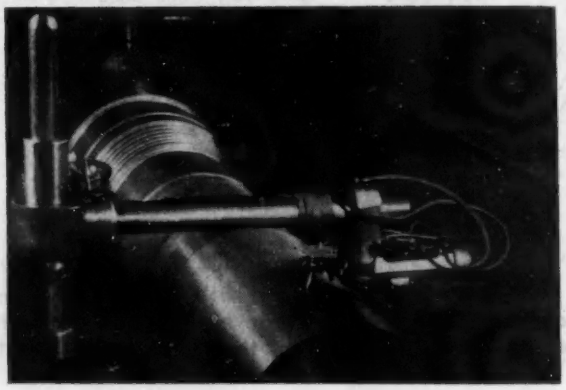
Finish life is the length of time a tool will cut at a given speed without appreciable change in finish. It is either less than or equal to tool life. It may be determined by visual inspection or by measurement of surface roughness with a suitable instrument. It is often possible to find pronounced visible finish changes, when cutting with oil, long before the tool has failed completely. Unfortunately, finish changes are not so noticeable at higher speeds or with dry cutting, so that visual inspection is not sufficient for these tests. It is also difficult to measure change in depth of cut due to tool wear.

Surface Comparator

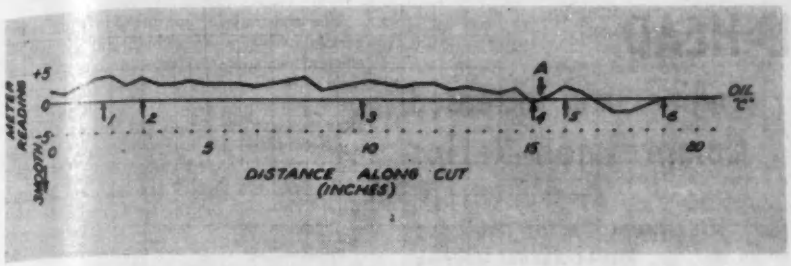
To detect less noticeable finish changes, we have devised an instrument, shown in Fig. 1, which we call a surface comparator. It consists of three principal parts – pickup unit, amplifier, and meter. The pickup unit is made from a phonograph crystal cartridge with a sapphire-tipped needle. The pickup arm is counterweighted so that the pressure on the needle is about 2 oz. The needle can only move a few thousandths of an inch from side to side. This small movement is desirable so that the needle can find the groove made by the tool. The needle is made to travel in the cut by using the same feed per revolution that was used when the cut was made. Finish readings are made when running the lathe at about 30 surface fpm. The meter reading gives an indication of relative roughness, the higher the reading, the rougher the surface.

A true indication of relative roughness is obtained only if the finish is all of the same type. If, for example, the finish changes from a uniform groove to a torn surface, the true character of the finish will not be shown.

Finish life tests are run in conjunction with tool life tests so that a comparison may be made between the two. The tools are first run to tool failure and then the surface is inspected for finish failure. After each tool has been run, the surface is marked off in ½-in. increments. Finish measurements are made at each mark, so that finish readings may be plotted against length of cut. The plotted points are connected with straight lines so that a broken-line curve is produced. Fig. 2 shows the curve produced from the readings taken from one of the cuts on oil "C." At the point *A* a visible finish change was noticed,



■ Fig. 1 – Pickup of surface comparator in operating position



■ Fig. 2 – Surface comparator readings for one cut using oil "C"

although the finish did not change much up to this point.

The finish life can be calculated by multiplying the tool life by the ratio of the distance to finish failure to distance to tool failure. After finish life is known for several speeds, the finish life is plotted against cutting speed on logarithmic paper. A straight line may be drawn through the points. The finish curve usually has a greater slope than the tool life curve, indicating that tool life is relatively longer compared to finish life as cutting speed is decreased. As tool life becomes very short, finish life approaches tool life.

Comparison of oils may be quite different when finish life is used instead of tool life. For oil "B" the increase in cutting speed over dry cutting at 300-min tool life is 23.7%, and for oil "C" it is 27.2%, that is, on this basis their performance is quite similar. When the comparison is based on finish life, however, the performance of the oils is quite different. For oil "B" the increase in cutting speed over dry at 300-min finish life is 11.8%, but for oil "C" it is 35.8%. Obviously, oil "C" is better for finish cuts, but the tool life test does not show this to be so.

Quality of Finish

Another item of importance is the quality of finish produced. We have developed a method whereby the finish with oil may be compared witih the finish with dry cutting. We use the same type of tools as for tool life tests and the same feed and depth of cut. Three tools are run with oil and three dry. Each tool is run at five speeds for a short time so that finish readings may be taken at each speed. The readings for each speed are averaged and smooth curves are plotted for both oil and dry cutting. The area between the curves is used as a means of classifying finish.

It would seem that dry cutting is better than cutting with oil because it produces a smoother finish. However, if it is remembered that for the same tool life or finish life higher speeds are permissible with oil, better finish can be obtained with oil than with dry cutting.

Additional tool life tests were run at constant cutting speed with varying side rake angles from 0 to 40 deg. Some conclusions were drawn as to the practical application of cutting oils from these tests. Active sulfur in an oil has the tendency to prevent seizure betwen the chip and the tool but requires sufficient heat to perform that duty. Chlorine increases the strength of the lubricating film and has the apparent ability to keep the chip and the tool lubricated. If pressure becomes too great, the film will rupture, causing seizure. We can say that under light cutting operations where large rake angles are permissible, an oil should have a high lubricating quality. With heavy cutting operations where small rake angles are necessary, the oil will be operating under greater heat and pressure, therefore it should have a high antiweld property. If active sulfur is present in oil that is used for a light operation, it will act as an abrasive and decrease tool life. For this reason it is important to select the correct oil for each job.

Discussion

In almost every tool life test, Prof. O. W. Boston, University of Michigan, stated, there is a preliminary failure occurring before final or total failure. If the time of preliminary failure is plotted on log-log paper along with total failure time, a straight line is usually obtained that is below the line for total failure. For a given set of conditions this preliminary failure line may or may not be parallel to the total failure line. This relationship is fixed for a given set of conditions, but varies as conditions are changed; therefore, preliminary failure is not a satisfactory basis on which to evaluate performance. Further, the tool will cut for a longer time up to complete tool failure without changing the surface quality on the work if preliminary failure occurs on the side of the tool against the shoulder of the cut.

Side Rake Angle

Prof. Boston also thought the authors used a tool shape having too low a side rake angle. This practice increased temperatures and served chiefly to stress the importance of using oil. It would be better to use the correct side rake angle to get the maximum cutting speed for a given tool life, and then apply the correct type of cutting fluid to increase cutting speed still further.

Complete information as to what goes on when metal is cut under the presence of cutting fluid is lacking, Prof. Boston continued. At high cutting speeds under conditions of continuous cutting, more benefit is derived from the cooling effect of a cutting fluid than through its lubrication; however, this is not true at low speeds, where lubrication is the more important factor.

Mr. Moir replied that the low rake angle deliberately was used to appreciate the additives in the oil and because low rake angles customarily are used in practice. In commercial operations, he added, there are few ideal situations, for few operators use the same rake angle. While manufacturers recommend low side rake angles, operators use the angles that seem best to them personally.

ENGINEERS Should Learn Business As Well As Technology

by **EDMUND T. PRICE**
Solar Aircraft Co.

■ **Southern California, Dec. 28**

(Excerpts from a paper entitled "What a Young Engineer Should Know")

FUNDAMENTALLY, manufacturing business is divided into two groups: sales and manufacturing. Everything else serves these groups. Next in importance are the accounting department, which keeps a record of sales and costs and of assets and liabilities, and the engineering department, which improves or designs new products.

The engineer is a specialist in a rarefied atmosphere, and as such is frequently only a tool in business. So, early in his career, he must make up his mind as to whether he wishes to continue in engineering for engineering's sake or whether he wishes to gain a broader comprehension of the business world to become a more valuable unit of society, both for his company and for himself. In the early days of aviation, some engineers started airplane manufacturing companies which resulted in tremendous losses to themselves and to their stockholders. Some succeeded, because they were smart enough to realize that they alone could not run the show with the training they had had and they associated themselves with business men and sales managers to represent them to the public and to Government. They fitted themselves for the career of business by study and training.

What kind of training? Can you discuss with the production engineer the merits or demerits of putting in a new machine to do a certain piece of work? Or can you decide for him the best layout for floor space, arrangement of working tables, places where conveyor belts would pay and where they would not pay? Are you up on the latest methods of manufacture to accomplish certain results? What is the efficiency of the average worker in your plant? These problems come up to the plant manager, of which the engineer seldom hears except through publications of societies which bring shop problems to your attention.

Or supposing that the cost estimating department of your outfit has determined that a piece of goods should be sold for a certain price. Are you prepared, as a member of the sales force, to present that price in competition, and still win the contract for your company because of its better service? An era of competitive selling will take place which will tax the best resources of our most skilled salesmen. Engineers will see curtailed operations and will tend to blame the sales department for not producing enough orders to keep them busy. Some companies may go under, because they have not given, in these days of lush sales, sufficient attention to the education and training of salesmen. We established a department of field service recently and took a few men out of the engineering department to train in sales tech-

nique. This is part of broadening the base of the engineer.

In accounting, how many of you can read a balance sheet? Do you know what a reserve for depreciation is? All of these questions are submitted at one time or another to the heads of manufacturing or sales or accounting, and yet, many of you wonder why recognition in your chosen profession comes slowly. You have not seen yourselves and your engineering department in the broad perspective of a business which literally has thousands of questions to decide in manufacturing and sales and accounting besides those of engineering. If you seek larger interests, you cannot avoid training in these departments – now.

Except for one thing. More than at any time since the advent of the industrial revolution, the demands of business today call for the services of men who can lead others. Corporation managers are likely to retain engineers in their organizations whose abilities and judgment cover several fields and where a man also does his part in maintaining morale – one who shows signs of genuine leadership.

One other aspect in the training for life is: take some creative work not allied with yourself or your business career and study it on the side. Make it a secondary life work.

L-HEAD
Engines and Increased Compression Ratios

by E. J. WILLIS,
Aluminum Co. of America

▪ *1944 Annual Meeting*

(Excerpts from paper entitled "Some of the Problems Presented in L-Head Engines Due to Continued Increases in Compression Ratio")

FOR a long period of time there has been considerable controversy concerning the possibilities of overhead valve engines vs the L-head engines for passenger car operation. There are features in both motors which, if considered singly, might force all manufacturers to that particular type. The case of the overhead engine has been presented many times and seems, at first thought, to have many advantages at high compression ratios. On the other hand, the continued use and improvement of the L-head engine with ratios as high as practical at this time should be entirely satisfactory.

The most useful compression ratio to the general public is one which will give highly efficient service for the longest period of time with the minimum trouble. The compression ratios which will be used directly after the war are dependent upon the octane number of the gasoline which will be available. A. T. Colwell indicates in his recent SAE paper that octane numbers of approximately 80 will be the best premium fuel available to the public. If this is the case, it immediately rules out the extremely high compression ratios of 9 and 10 to 1 since there is little advantage in either type of engine to be gained without higher octane gasoline than 80 at these high ratios. In jumping from 7 up to 8, we are approaching the point where any increase higher than this shows less and less benefit.

It is practical to design relatively simple combustion chambers for L-head engines at 8.5 to 1. Other articles have mentioned that the transfer area between the valve end of the combustion chamber and the piston end of the chamber will become a bottleneck to efficient design.

In our experimental work we have found several things which prevent this restriction from occurring, even at high compression ratios.

1. Tilting the axis of the valve center line toward the cylinder center line at the top of block shortens the combustion chamber length and makes the chamber more compact.

2. A nib protruding from the top of the combustion chamber dome containing the spark plug is of marked advantage in increasing fuel economy and smoothness of operation. The only disadvantage seems to be that a small spark plug must be used for the maximum benefit.

3. Extending the piston upward into the combustion chamber allows the maximum transfer area at increased compression ratios. This also shortens the flame travel still farther.

The overhead valve engines have proved that pistons with high domes operate satisfactorily even when exposed directly to the explosion gases. The L-head engine protects the piston dome from the flame much better because of the proximity of the head, making the high dome piston even more practical in this type of engine. Much can be done to improve roughness by chamber design, but the maximum power which can be obtained from a given chamber shape seems to be nearly constant at the same compression ratio. We do not seem to have sufficient knowledge at this time to distribute the volume in the chamber properly for higher ratios than approximately 8½ to 1.

Cylinder head and piston material does affect performance. Aluminum pistons and heads allow greater spark advance with less detonation. Spark setting is less critical. The result of this is better fuel economy and more torque.

I would like to advance a rather drastic theory based on the assumption the maximum engine speeds will be about 3500 rpm. It is possible to restrict the intake manifold so that the maximum breathing capacity of the engine coincides with this maximum engine speed. This will allow smaller intake manifolds and better carburetion. The part load economy of an engine is definitely increased and extreme spark advance under part throttle conditions is more easily attained. Extremely good gasoline mileage will result by these changes.

Urges Interest of Engineers in National Affairs Because Future Welfare Needs Engineering Approach

by N. P. PETERSEN,
Canadian Acme Screw & Gear, Ltd.

▪ *Canadian, Jan. 19*

(Excerpts from a paper entitled "The Fifth Freedom – The Right to Work")

ENGINEERS, professional men, and business executives must become interested in national affairs because:

- Reconversion and re-employment are basically engineering problems;
- Parliamentarians are incapable of solving our immediate future problems without assistance;
- Radicals will force upon government their plans if we do not help by insisting upon being heard and giving our best, and
- Professional and production men possess trained intellect.

To the Four Freedoms of Fear, Want, Speech and Worship should be added a fifth: Our right to work without paying tribute and without bureaucratic restrictions.

You should be warned against any planned type of government under which security and freedom would disappear. Remember:

Under totalitarianism All Things are compulsory or forbidden.

Public affairs, politics, and social gains go hand in hand. Efficient improvement can be gained only by intelligent planning; or conversely, practical planning and a better understanding of public affairs will attract technically trained men, replacing crackpots, so-called reformers, and outright racketeers who make so much noise and so many threats against our present democratic way of life.

All of us in Canada have a right to work at our lawful pursuits without paying tribute, without being beset, and without irksome regulations put on the statutes by some political meddler.

I hope Canada and all of us will be spared the calamity which has beset many nations under the guise of social progress. Work would then consist of directed chores; if one could qualify as an intelligent slave he would be expected to be happy; a few would become "commissars" – but even such high ranking officials have a low order of social security and a relatively short life. Anyway you look at it, there is little or no future in it for anyone.

The worth of the state is the worth of the individuals composing it. State or government help has reduced our ability and our desire to help ourselves, and has resulted in regimentation of opinion and tends to make the average citizen regard measures not to his liking as inevitable – and therefore not worth the trouble of opposition.

We should fight for and speak up for equality of opportunity – and encourage ambition and better education. We should instill in the minds of the young that social security depends much more upon their own effort than on the help of the state.

In none of the well-advertised youth movements have I seen any reference to hard work.

Innumerable efforts are being made to persuade our people that Canada's future depends upon vast expansion of state functions with corresponding reduction of individual rights, instead of coming right out and saying "Canada's future depends upon hard work."

Our privilege of free enterprise, our liberty, our freedom, are in peril. I am talking about very simple things – your own sons', your daughters', your neighbors', your employees', your *own right to work*.

National AERONAUTIC MEETING

DESIGN · PRODUCTION · ACCESSORIES

APRIL 5-6-7

Hotel New Yorker ★ New York City

General Chairman, A. L. Beall

MEETINGS CHAIRMEN

A. L. BEALL
Chairman
Aircraft Engine Activity Meetings Committee

PETER ALTMAN
Chairman
Aircraft Activity Meetings Committee

WEDNESDAY, APRIL 5

MORNING — Aircraft Design

Measurement and Prediction of Aircraft Vibration
– E. Forest Critchlow, Civil Aeronautics Administration

MORNING — Aircraft Engine Design

Aircraft Engine Cooling Fans
– Kenneth Campbell, Wright Aeronautical Corp.

Aircraft Engines in Tanks
– G. Waine Thomas, Continental Motors Corp.

AFTERNOON — Aircraft Design

Recent Trends in Airplane Ice Prevention Technique
– Lewis Rodert, National Advisory Committee for Aeronautics

Ice and the Airplane
– J. E. Gulick, B. F. Goodrich Co.

AFTERNOON
Aircraft Engine Design

Cold-Weather Starting and Operational Problems
– G. A. Bleyle, Wright Aeronautical Corp.

Propeller and Gear-Ratio Requirements for Long-Range Aircraft
– R. S. Schairer, Douglas Aircraft Co., Inc.

EVENING
Joint Aircraft and Aircraft Engine

Combat Maintenance
Speaker to be announced

THURSDAY, APRIL 6

MORNING — Aircraft Design

Fundamentals of Airplane Design
– A. L. Klein, Douglas Aircraft Co., Inc.

Basic Principles of Power Boost Flight Controls
– E. G. Riley, Glenn L. Martin Co.

MORNING — Aircraft Engine Design

Stresses in Disc Wheels
– William Knight, Propeller Division, Curtiss-Wright Corp.

Piston Ring Development for the V-770 Engine
– C. H. Van Hartesveldt and M. Epps, Ranger Aircraft Engines, Division Fairchild Engine & Airplane Corp.

AFTERNOON
Joint Aircraft and Aircraft Engine

Symposium on Intake Charge Cooling

Aerodynamics of Cooling Ducts
– K. F. Rubert, National Advisory Committee for Aeronautics

Relation of Intake Charge Cooling to Engine Performance
– E. A. Droegemueller and D. S. Hersey, Pratt & Whitney Division, and W. A. Kuhrt, Research Division, United Aircraft Corp.

Importance of Intercooling on Airplane Performance
– Philip A. Colman, Lockheed Aircraft Corp.

EVENING ★ ★ DINNER

– J. Carlton Ward, Jr., Toastmaster

Usefulness of the SAE to the Aircraft Industry
– W. S. James, President SAE

Combat Experience with American Aircraft
– Major-Gen. Frank O'D. Hunter, Commanding General, First Air Force, Mitchell Field

FRIDAY, APRIL 7

MORNING — Aircraft Accessories

Particulars of the German V.D.M. Electric Propeller
– John D. Waugh, Lockheed Overseas Corp.

Propeller Efficiency of a Light Airplane
– K. D. Wood, Purdue University

MORNING
Aircraft Engine Production

Aircraft Engine Production as Viewed by an Automobile Manufacturer
– J. G. Vincent, Packard Motor Car Co.

An Investigation of Chafing on Aircraft Engine Parts
– H. C. Gray and R. W. Jenney, Wright Aeronautical Corp.

AFTERNOON — Aircraft Production

The Design for Production of Sheet Metal Aircraft Parts
– F. M. Mallet, Airplane Division, Curtiss-Wright Corp.

Analysis of Airframe Production Methods in the Aircraft and Automotive Industries
– Thomas N. Kelly, Consolidated Vultee Aircraft Corp.

AFTERNOON — Aircraft Accessories

Hydraulic Engine and Power Controls
– Howard Alexanderson, Eclipse-Pioneer, Division Bendix Aviation Corp.

Pre-Rotation of Landing Gear Wheels
– H. F. Schippel, B. F. Goodrich Co.

SAE Coming Events

Baltimore – Mar. 9

Engineers Club; dinner 6:30 p.m. Speaker and subject to be announced.

Buffalo – Mar. 15

Markeen Hotel; dinner 6:30 p.m. Stability and Control Problems of the Helicopter – A. F. Donovan; Curtiss-Wright Wind Tunnel – Dr. N. B. Moore; Plastics for the Aircraft Industries – M. Schneider; Research Division, Airplane Division, Curtiss-Wright Corp. Technical Chairman – Dr. C. C. Furnas, director of research, Airplane Division, Curtiss-Wright Corp.

Canadian – Mar. 22

Royal York Hotel, Toronto; dinner 6:30 p.m. War's Impact on Post-War Fuels and Lubricants – William S. James, chief engineer, Studebaker Corp., and president, SAE. Guest – John A. C. Warner, secretary and general manager, SAE.

Chicago – Mar. 14

Knickerbocker Hotel; dinner 6:45 p.m. Post-War Transportation – Automotive – Raymond Loewy, industrial designer.

Cleveland – Mar. 13

Cleveland Club; dinner 6:30 p.m. Some General Aspects of Synthetic Rubber – R. P. Dinsmore, vice-president, Goodyear Tire and Rubber Co.

Colorado Group – Mar. 21

Meeting at Winter Weiss Co., Denver; 7:45 p.m. New Wrinkles in Scientific Research – Walter Lief, charge of Research Laboratories, Denver and Rio Grande Western Railroad.

Detroit – Mar. 6 and April 3

Mar. 6 – Hotel Statler; dinner 6:30 p.m. Development of the Rolls-Royce Merlin Engine – James E. Ellor, chief research and development engineer. Aeronautical Division, Rolls-Royce, Ltd.

April 3 – H. H. Rackham Memorial Building. The Future of Synthetic Rubber Quantity Production – Its Use Present and Future – F. B. Davis, chairman of the Board, U. S. Rubber Co.

Metropolitan – Mar. 2

Pennsylvania Hotel, New York; meeting 7:30 p.m. Symposium on Personal Airplanes. Practical Applications of the Helicopter as a Personal Airplane – W. Laurence LePage, president, Platt-LePage Aircraft Co. General Aspects of Future Personal Airplane Design – William D. Hall, chief engineer, Aeronca Aircraft Corp. The Personal Airplane from the Pilot's Viewpoint and Pilot's Requirements – Franklin T. Kurt, amphibian project manager, Grumman Aircraft Engineering Corp.

Mid-Continent – Mar. 17

Mayo Hotel, Tulsa, Okla.; meeting 7:30 p.m. Recent Developments in Filters and the Copper-top Piston – Landon B. Boyd, vice-president, De Luxe Products Corp.

Milwaukee – Mar. 8

Schroeder Hotel; dinner 6:30 p.m. Joint meeting with Army Ordnance Association. Speaker – Major-Gen. Levin H. Campbell, Jr., Chief of Ordnance, War Department.

New England – Mar. 14

Engineers Club, Boston; dinner 6:00 p.m. Maintenance on the Home Front – E. S. Harding, chairman of Advisory Committee, War Manpower Commission.

Northern California – Mar. 14

Leamington Hotel, Oakland; dinner 7:00 p.m. Speaker and subject to be announced.

Northwest – Mar. 3

Gowman Hotel, Seattle; dinner 7:00 p.m. Speaker and subject to be announced.

Oregon – Weekly Luncheons

Every Friday, 12:00 noon at Irelands, Lloyds Golf Course, Portland.

Philadelphia – Mar. 8

Engineers Club; dinner 6:30 p.m. More Horsepower per Pound of Diesel – Dr. Paul H. Schweitzer, professor of engineering research, Pennsylvania State College.

Pittsburgh – Mar. 16

Hotel Henry; luncheon 12:00 noon. Joint meeting with Aero Club of Pittsburgh. Rockets and Jet Propulsion as Applied to Aircraft – G. Edward Pendray, assistant to president, Westinghouse Electric and Manufacturing Co.

Southern California – Mar. 10 and 31

Mar. 10 – Clark Hotel, Los Angeles. Passenger Car Meeting. Speaker to be announced.

Mar. 31 – Hollywood Roosevelt Hotel, Los Angeles. Production Enginering Meeting. Speaker to be announced.

TO IMPROVE THE QUALITY of SAE National Meetings and to achieve a better balancing of meetings throughout the year, the SAE Meetings Committee swung into coordinating action on a 1944 Meetings Schedule earlier than in any recent year.

Aided by centralization of SAE Headquarters Staff meetings functions in a single department, the calendar on the opposite page – developed with the cooperation of the various SAE Activity Committees – has already been approved. It reveals the practical results of advance planning, undertaken to serve the best interests of the entire membership of the Society.

SAE Meetings Committee Chairman Ralph R. Teetor hopes that this forward-looking approach will:

1. Coordinate the specialized technical needs of each of the SAE engineering activities;

2. Achieve better timing and eliminate, in so far as possible, conflicts with other SAE National Meetings and meetings of other engineering societies;

3. Permit earlier planning of National Meetings' programs in order to obtain the best possible authors for technical papers;

4. Distribute the National Meetings geographically in order to reduce the total amount of traveling throughout the year;

5. Allow members to make hotel and travel reservations further in advance in view of the current reservation difficulties;

6. Give more time for authors to prepare their papers, and thus

7. Obtain the time necessary to plan fuller publicity, both prior to and during National Meetings.

From the standpoint of the individual member of the Society, advanced planning of National Meetings will be advantageous both in respect to assuring a wider range of technical subjects for discussion, and better geographical distribution of the National Meetings themselves.

He will find fewer conflicts with important meetings of other engineering societies of which he is a member, and in meetings of which he might care to participate.

He will be able to lay plans earlier for attendance at certain meetings, and will have a better chance to make hotel and travel reservations.

Details of each of the meetings, shown on the opposite page, have been developed by the Activity Committees with the closest possible cooperation of Thomas A. Bissell, SAE meetings manager, and members of the SAE staff assigned to the various SAE technical activities.

Southern Ohio – Mar. 14

Van Cleve Hotel, Dayton; dinner 6:30 p.m. Synthetic Rubber – Clint Doty, chief engineer, Connecticut Hard Rubber Co.

Twin City Group – Mar. 2

Curtis Hotel, Minneapolis; dinner 6:30 p.m. Post-War Applications of Aircooled Engines and Related Engine Cooling Problems – Phil Sidell, The De Bothezat Division, American Machine and Metals Corp.

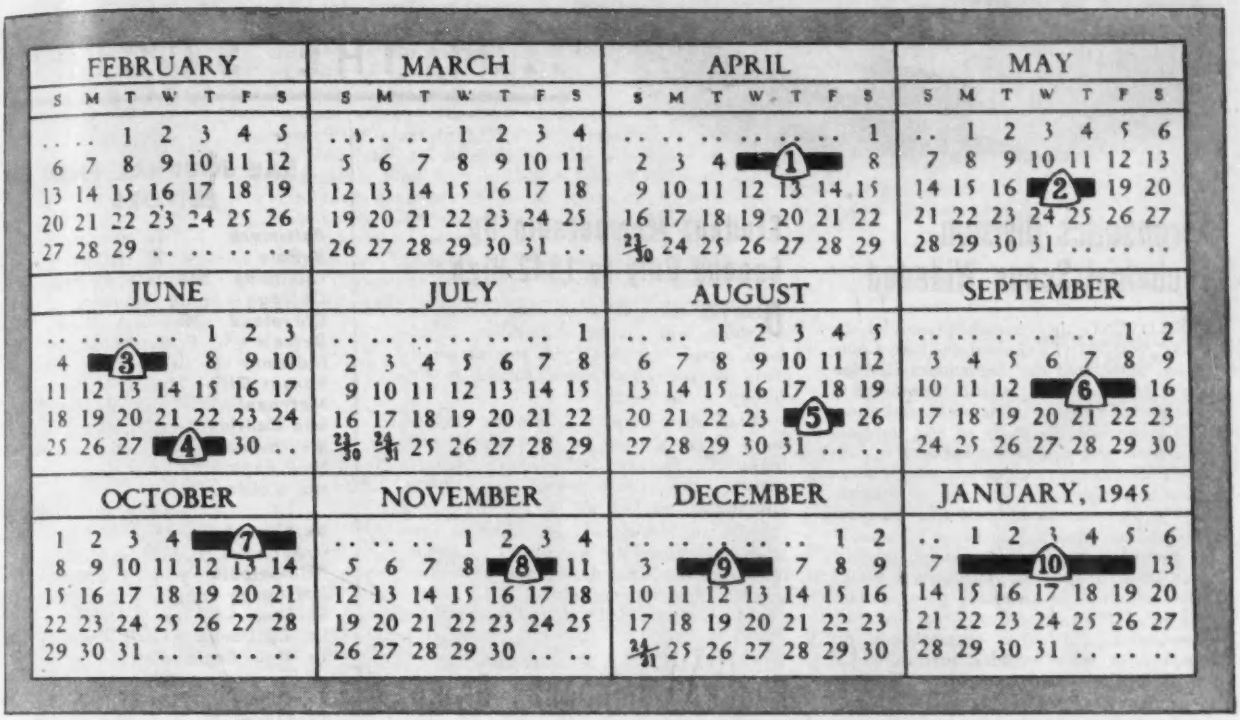
Washington – Mar. 13

Hotel Statler, Washington, D. C.; dinner 6:30 p.m. Past Chairmen's Night. Speaker – A. W. Herrington, chairman of the Board, Marmon-Herrington Co., Inc. Guests of Honor – SAE President William S. James and SAE General Manager John A. C. Warner.

Wichita – Mar. 1

Allis Hotel, Wichita, Kans. Helicopter Bus Transportation – Agnew E. Larsen, president, RotaWings, Inc.

SAE NATIONAL MEETINGS 1944



1	April 5-7	National Aeronautic	Hotel New Yorker	New York
2	May 17-18	National Diesel – F&L	Knickerbocker Hotel	Chicago
3	June 5-7	National War-Materiel	Book-Cadillac Hotel	Detroit
4	June 28-29	National T&M	Bellevue-Stratford Hotel	Philadelphia
5	Aug. 24-25	National West Coast T&M	Multnomah Hotel	Portland
6	Sept. 13-15	National Tractor	Schroeder Hotel	Milwaukee
7	Oct. 5-7	National Aircraft Engrg. & Prod.*	Biltmore Hotel	Los Angeles
8	Nov. 9-10	National Fuels & Lubricants	Mayo Hotel	Tulsa
9	Dec. 4-6	National Air Cargo	Knickerbocker Hotel	Chicago
10	Jan. 8-12, 1945	Annual Meeting*	Book-Cadillac Hotel	Detroit

*An Engineering Display will be held in connection with this meeting.

News..

..OF THE SOCIETY

Aeronautics Division Technical Scope Widened

FOLLOWING the recommendation of the SAE War Activity Council, the SAE Council has authorized the Aeronautics Division of the SAE General Standards Committee to expand the scope of its activities and functions to include the study of any technical subjects or problems of the industry leading to the development of information reports or technical recommendations on subjects and projects of broad industrial concern. This authorization was made in recognition of the needs experienced during the past three years for the SAE Aeronautical Standards committees to undertake projects other than standardization and to advise with the Government and other organizations on standards or other technical matters which are of broad industrial concern. This arrangement will provide a means whereby the Aeronautics Division may bring the best available talent to bear on technical problems of vital importance to the aeronautical industries and our Government.

Student Membership Up; Second Only to 1942 High

DESPITE the toll of war on student activity, with civilian registration at colleges sharply curtailed, SAE student enrollment in 1943 was second largest in the history of the Society.

While there were 703 students enrolled as of Dec. 31, 1943, a decrease of 20% below the previous year's record of 903, campus representation totaled 45, exceeding last year's figure of 43.

"This broadening of representation presages opportunity for widespread expansion of student activities during the immediate post-war period," commented A. C. Staley, chairman of the SAE Student Committee.

Rubber Compounds OK'ed

APPROVAL of a revised classification and physical requirements, developed by the new SAE Non-Metallic Materials Division of the Society, has been voted by Council. These will appear in the SAE 1944 Handbook.

A new specification for synthetic and reclaimed rubber coolant hose material, for medium and heavy-duty services, will also be included.

The group, formed last November, is headed by W. M. Phillips and W. J. McCortney.

SAE JOURNAL FIELD EDITORS

Baltimore – No Appointment
Buffalo – Charles E. Hathorn
Canadian – Warren B. Hastings
Chicago – Austin Stromberg
Cleveland – Merrell A. Wood, Jr.
Detroit – W. F. Sherman
Indiana – Harlow Hyde
Kansas City – Harold R. Porter
Metropolitan – Duis W. Meador
Mid-Continent – No Appointment
Milwaukee – Charles Duquemin
New England – James T. Sullivan
No. California – Edward J. McLaughlin
Northwest – D. M. Trepp
Oregon – A. B. Ogden
Philadelphia – James J. Crookston
Pittsburgh – Murray Fahnestock
St. Louis – George C. Davies
So. California – G. A. Zamboni
So. New England – Henry Clay Osborn
So. Ohio – W. H. Geddes
Syracuse – No Appointment
Texas – Tom Ashley
Washington – Fred Fielding
Wichita – No Appointment
Colorado Group – No Appointment
Mohawk-Hudson Group – No Appointment
Muskegon Club – Douglas W. Hamm
Peoria Group – Harry W. Fall
Twin City Group – Frank A. Donaldson, Jr.

President James is planning to talk before a number of Eastern Sections in the first half of the year. Here he is shown making a speech before the Chicago Section on Dec. 14. Seated are E. R. Barnard, Chicago Section chairman, and William H. Oldacre, technical chairman

SAE Forms Air Transport Engineering Activity Committee

By action of the SAE Council on Jan. 14 (*SAE Journal*, February, p. 22) the Society established its newest activity, and authorized the appointment by President W. S. James of an SAE Air Transport Engineering Activity Committee. Mr. James chose William Littlewood, vice-president in charge of engineering, American Airlines, Inc., as the new activity's first chairman. The Committee will be responsible for the development of meetings and for selection of speakers and topics of interest to members in the operation of air lines and maintenance of air transport equipment. The new Committee plans to hold its first meeting during the SAE National Aircraft Meeting scheduled for April 5-7 in New York – at which time it will nominate seven members of an Air Transport Activity Nominating Committee whose function it will be to nominate a vice-president of the Society representing Air Transport Activity for 1945. Serving with Chairman Littlewood and Vice-Chairman Thomas Wolfe are the Activity Committee members shown here

CHAIRMAN

WILLIAM LITTLEWOOD
Vice-president, American Airlines, Inc.

VICE-CHAIRMAN

THOMAS WOLFE,
Vice-President, Traffic, Western Air Lines, Inc.

MEETINGS CHAIRMAN

CHARLES FROESCH,
Chief Engineer, Eastern Air Lines, Inc.

W. G. AINSLEY,
Chg. Eng. Lab., Sinclair Refining Co.

PETER ALTMAN,
Dir. Mg. Res. Dept., Vultee Aircraft, Inc.

A. L. BEALL,
Research Engr., Wright Aeronautical Corp.

A. W. DALLAS,
Air Transport, Association of America

MEMBERSHIP CHAIRMAN

H. D. HOEKSTRA,
Aircraft Engr. Div., Civil Aeronautics Adm.

COL. HAROLD R. HARRIS,
Air Transport Command, Army Air Forces

J. A. HERLIHY,
Executive Vice-President, United Air Lines Transp. Co.

K. O. LARSON,
Chief Engineer, Northwest Airlines, Inc.

H. R. PORTER,
Transcontinental & Western Air, Inc.

CAPT. C. H. SCHILDHAUER,
Naval Air Transp. Serv., U. S. Navy Department

HUMPHREY TOOMEY,
Division Engineer, Pan American Airways

EDW. WARNER
Vice-Chairman, Civil Aeronautics Board

Aero Engine Group Changes Its Name

BECAUSE of the nature of its expanded tasks, the SAE Aircraft Engine Subdivision Committee E-1 has changed its name to Carburetor and Fuel Metering Installations, announces F. J. Wiegand, Wright Aeronautical Corp., chairman.

The group has been assigned the preparation of standards for fuel injection systems.

Serving with Chairman Wiegand are M. P. Chandler, Chandler-Evans Corp.; M. J. Kittler, Holley Carburetor Co.; R. C. Palmer, Pratt & Whitney Aircraft; H. G. Tarter, Bendix-Stromberg Division, Bendix Products Corp., and M. A. Trisler, Allison Division, General Motors Corp.

Mills Heads Aero Engine Standards Parts Committee

SUCCEEDING the late P. S. Farnsworth, Pratt & Whitney Aircraft, M. E. Mills, Wright Aeronautical Corp., has been appointed chairman of Committee E-5, Standard Parts, of the Aircraft Engine Subdivision. A former member of the committee, Mr. Mills is also chairman of the subcommittee E-5A on Standard Parts, and a member of E-5C, AN Standard Parts.

Serving with Mr. Mills are J. E. Jackson, Pratt & Whitney Aircraft, and Douglas Johnson, Jacobs Aircraft Engine Co., chairmen of E-5B and E-5C, respectively.

The committee has been assigned to review and prepare recommended revisions to all AN standards applicable to aircraft engines.

Members of New SAE Non-Metallic Materials Division

CHAIRMAN **VICE-CHAIRMAN**

W. M. Phillips

R. L. Barton

F. H. Bromm

J. J. Crookston

W. P. Eddy, Jr.

J. M. Gauss

R. J. McCortney

Personnel of the SAE Non-Metallic Division recently organized (SAE Journal, January, 1944, p. 46) which will supervise all non-metallic materials specifications under the direction of the SAE General Standards Committee, is shown in these groupings, above and below

P. W. House

J. P. Wilson

H. W. Mohr

H. A. Polderman

C. R. Reller

H. M. Schudt

R. B. Gray

Gerald Reinsmith

Military Vehicle Bulb Table Has Been Approved

COUNCIL has approved the recommendation of the SAE General Standards Committee that a revised table of electric lamp bulbs and sealed-beam units for use on military vehicles be included in the SAE 1944 Handbook.

This work of the SAE Lighting Division, under the chairmanship of R. E. Carlson, is based upon the latest specifications of the Army Ordnance Department, and will include the new parts numbers established by the Army, together with superseded Army and Navy parts numbers, for the purpose of reference.

New Fittings Specs

Revisions and Additional Data Approved for 1944 Handbook

STANDARD fuel and oil tube fitting dimensions have been revised by the Parts & Fittings Division, and approved by Council for publication in the 1944 SAE Handbook.

The revisions include:

Specifications covering standard tapered pipe thread for pressure tight connections;

New SAE standards for Short Taper Pipe Threads, and added feature;

Specifications for straight thread fittings and

Specifications for standard thread gages, pipe thread tap drills, and dimensions for the fitting blanks for the external taper pipe threads on the fittings.

Standards for the regular taper pipe threads are in accordance with the newly revised American Standard Taper Pipe Threads.

The new SAE revisions provide standards for a complete line of fittings having pressure type connections.

Arthur Boor is chairman of the Parts and Fittings Division of the SAE General Standards Committee.

Heads Aero Engine Design Committee

K. C. MEHRHOF, Wright Aeronautical Corp., has been appointed chairman of the Aircraft Engine Subdivision's Committee E-12 on Design, Data, and Drawings, succeeding B. Osborn, of the same company.

The committee's project on engine nomenclature will be confined to terms about which there is some confusion in the industry. Serving on the committee with Chairman Mehrhof are:

B. Cane, Lycoming Division, The Aviation Corp.; J. F. Devlin, Ranger Aircraft Engines; A. N. Hitchcock, Pratt & Whitney Aircraft, and W. M. Tyler, Allison Division, General Motors Corp.

Non-Ferrous Specs

Task of Revision Approved With Ample Reference Data

COMPLETE revision of all SAE non-ferrous metals specifications, developed by the Non-Ferrous Metals Division under the chairmanship of W. H. Graves, has been approved by Council for inclusion in the SAE 1944 Handbook.

These are in accordance, in so far as possible, with the corresponding specifications of the ASTM, Federal Specifications Board, Army, Navy, and the SAE-AMS (Aeronautical Materials Specifications).

Several old compositions have been discontinued in the new series, and a number of new alloys added – particularly those of aluminum, magnesium, brasses and bronzes – in view of the critical materials situation.

Important among the changes was the incorporation of chemical compositions in tabular form, thus condensing the data.

Notes on distinguishing the character and use of the alloys have been expanded, and cross-reference tables have been added for each class of material. These refer to the equivalent or similar compositions listed in the Government and other specifications noted above.

Special attention has been paid to bearing metals. Specifications for this class of material have been revised to meet current practice. For example, additional information is included for bearings of sintered metal powder types of bearings.

Ignition Systems

Two SAE Standards Groups Merged on Expanded Program

MERGER of two committees of the SAE Aircraft Engine Subdivision has been announced by Chester E. Mines, chairman, because of the completion of the work assigned by one of the committees, and an expanded program of projects by the other. The name of the new committee will be Ignition Systems (E-3) and in it will be included some of the members of the committee on Spark Plugs, Ignition Shielding and Ignition Cable (E-4).

Chairman E. K. Von Mertens, Pratt & Whitney Aircraft, will continue to head the group, and A. L. Beall, Wright Aeronautical Corp., formerly chairman of E-4, will serve on this committee as soon as the work on AMS 3087 is completed. Other members of the committee on Ignition Systems will be J. L. Arthur, Allison Division, General Motors Corp; J. P. Flannery, Aircooled Motors Corp., and L. L. Beltz, Packard Motor Car Co.

The revised committee will be in charge of the Society's standards work on all phases and parts of aircraft engine ignition systems.

NE Steels Revised

Cooperative Work Permits Optimum Use of Scrap

TO permit a greater flexibility in the use of scrap steels from armament plants in the war effort, revisions of the NE (National Emergency) Steel Specifications will be published in the 1944 SAE Handbook as a result of Council action Jan. 14, according to John H. Hunt, chairman of the SAE General Standards Committee.

Cooperation by the Iron & Steel Division, headed by F. P. Gilligan, and W. P. Eddy, Jr. with the Technical Committee on Alloy Steel of the American Iron & Steel Institute, the Army Ordnance Department, and the SAE War Engineering Board, was responsible for these revisions, under the aegis of the War Production Board.

Optimum use of scrap, particularly in handling turnings and borings, and higher recovery of molybdenum from scrap are permitted by the use of the new series.

Furthermore, the new series of NE steels removes objections on the part of consumers to the use of steels containing higher than the normal quantities of silicon.

Hence the NE 9400 series was modified by reducing silicon content to 0.20 to 0.35%; chromium content was increased to 0.30 to 0.50%, and nickel content increased to 0.30 to 0.60%. It is believed that these changes will not materially affect hardenability characteristics, and should hence fit into testing programs now in progress.

NE 8020, NE 8442 and the entire NE 9600 series have been *withdrawn*.

NE 9261, NE 9425, and NE 9545 have been *added*.

Chromium content of NE 9262 has been revised to read 0.25 to 0.40%.

Copies of the revisions are available prior to the issuance of the SAE 1944 Handbook from the American Iron & Steel Institute, 350 Fifth Avenue, New York, N. Y.

In addition to the revised list of NE steels, the 1944 Handbook will also include three revised and extended tables of hardness conversion numbers to replace the single table in the 1943 issue (p. 363). These will be based upon:

1. Vickers (diamond pyramid hardness),
2. Brinell, and
3. Rockwell C.

The tables, developed jointly by committees of the ASTM, the ASM and the SAE, extend down to DPH 240 and the equivalent Brinell and Rockwell A, D, and Superficial scales.

The SAE tables continue the DPH scale down to 85, with the Brinell and Rockwell C scales continued down correspondingly. The Rockwell B scale also extends upward beyond 100, for reference information.

The SAE tables also include the normal Rockwell B scale, the Scleroscope scale (Shore) down to 20, and approximate equivalent tensile strengths down to DPH 120.

The text includes a brief description of each testing method with references to the ASTM standard method for each type of test.

The Army – Navy scales of hardness numbers as given in AN-QQ-H-201 are continued for the duration as they are extensively used by Government services.

Roller, Ball Bearing Standards Expanded

COUNCIL has approved the recommendations of the SAE General Standards Committee that extensive revisions developed by the Ball & Roller Bearing Division be promulgated as SAE standards and be published in the 1944 SAE Handbook. The work was based upon recommendations of the ball and roller bearing industry through the Anti Friction Bearing Manufacturers Association, which cooperates closely with the Society.

The action includes an expansion of types and detailed dimensions, and descriptive classifications of various types, involving:

1. Uniform system of type and size designation or identification numbers, and

2. Provision for two additional classes of tolerances for the outside diameters and bores.

Serving with Chairman D. E. Batesole of the Division were H. R. Reynolds, vice-chairman; D. F. Chambers, L. A. Cummings, T. C. Delaval-Crow, Gunnar Palmgren, R. M. Riblet, Ernest Wooler, and O. W. Young.

New and Revised Pages Approved for Drafting Manual

Just published as of Jan. 1, new and revised pages of the Aircraft Engine Manual of Drafting Room Practices are now available. The material includes lettering styles, lower case; explanation of change letters for use on drawings; names and titles; four pages on taper pipe thread data; and a new page, beginning Section H, on definitions of terms for use in drawings. These eight sheets are available at SAE Headquarters for 35 cents, postpaid. Members of the Committee on Drafting Room Practice (E-8) SAE Aircraft Engine Subdivision, are: (front row, left to right) P. V. Richards, Wright Aeronautical Corp.; J. G. Schweiger, Ranger Aircraft; John G. Perrin, chairman, Pratt & Whitney Aircraft; and C. R. Reynolds, Allison Division, GMC. (Rear row, left to right) E. W. Rentz, Jr., SAE staff; H. W. Espler, Lycoming Division, The Aviation Corp.; and R. S. Kellogg, Packard Motor Car Co.

Preferred Specifications for Aeronautical Steels
National Emergency Steel Specifications (NESS)

HEREWITH is a revised list of the aeronautical steel specifications set up in 1942 under the auspices of the National Emergency Steel Specifications program with the object of increasing production through simplification and standardization. The first list was published in the *SAE Journal* of September, 1942. The present list not only reflects revisions in the earlier one, but also incorporates in a single list the alternate compositions which previously were included under a tentative classification. This list is intended to assign to these alternate triple-alloy steel specifications a preferred classification, in anticipation of their becoming – on a tonnage basis – the predominant types for aircraft production.

Proved by extensive laboratory and type tests undertaken by the aircraft industry with the support of the Air Services, both the original and revised lists of specifications were developed by a special NESS technical advisory committee on aeronautical steels headed by J. B. Johnson, chief, Materials Section, Materiel Command, Army Air Forces, Wright Field, who also is chairman of the Aircraft Materials and Processes Coordinating Subdivision of the Aeronautics Division of the SAE Standards Committee. (The SAE, together with the American Society for Testing Materials and the Iron & Steel Institute, has been an integral part of the general NESS program since its inception.) Mr. Johnson also represents the War Department in addition to being chairman. Serving with Mr. Johnson on this NESS Technical Advisory Committee are: John Mitchell, metallurgical engineer, Alloy Division, Carnegie-Illinois Steel Corp., as secretary; Lt.-Com. W. P. Goepfert, Bureau of Aeronautics, representing the Navy; (Alternate: N. Promisel, Bureau of Aeronautics); Capt. S. D. Daniels, Army Air Corps, representing the Army-Navy Aeronautical Board; Lt. Col. John H. Frye, chief of Materials Section, Office of Chief of Ordnance, representing the Federal Specifications Executive Committee; L. D. Bonham, process engineer, Lockheed Aircraft Corp.; H. A. Campbell, research engineer, Solar Aircraft Co.; B. Clements, chief metallurgist, Wright Aeronautical Corp.; Eric Dudley, materials & standards engineer, Airplane Division, Curtiss-Wright Corp.; W. H. Graves, chief metallurgist, Packard Motor Car Co.; R. B. Gray, chief of laboratories, Glenn L. Martin Co.; A. W. F. Green, materials engineer, Pratt & Whitney Aircraft of Missouri; R. L. Heath, chief metallurgist, Allison Division, General Motors Corp.; Horace C. Knerr, president, Metallurgical Laboratories, Inc.; R. R. Moore, senior metallurgist, Naval Aircraft Factory; C. L. Stevens, Ford Motor Company; W. J. Beuchling, chief metallurgist, Copperweld Steel Co.; W. G. Bischoff, metallurgical engineer, Steel & Tubes Division, Timken Roller Bearing Co.; L. L. Ferrall, metallurgical engineer, Rotary Electric Steel Co.; M. J. R. Morris, chief metallurgical engineer, Republic Steel Corp.; E. T. Walton, superintendent of metallurgy & inspection, Crucible Steel Co.; Henry Wysor, metallurgical engineer, Bethlehem Steel Co.; J. S. Adelson, chief metallurgist, Steel Tubes Division, Republic Steel

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Carbon Steels

General Trade Designation		Government Specifications: Army-Navy Aeronautical and Federal	Army and Navy	Army Air Forces	Navy Bureau of Aeronautics	SAE Aeronautical Material Specifications (AMS)
BARS, RODS AND FORGINGS						
Screw stock	1112	....	46S17C-Cl. B	....	....	5010A
Screw stock	1120	....	46S17C-Cl. A	....	....	....
1.3 Manganese, Free Cutting	1117	....	....	....	....	5022A
1.5 Manganese, Free Cutting	1137	....	....	....	....	5024A
1.5 Manganese, Free Cutting, Heat Treated	1137	....	....	....	....	5023
	1015	....	46S32(Int.)Cl. A	....	....	5060A
	1020	AN-QQ-S-646-1	....	....	....	....
	1022	AN-QQ-S-646-1	....	....	....	5070
	1025	AN-QQ-S-646-1	....	....	....	....
	1035	AN-S-4	....	....	....	5030
	1095	AN-S-5	....	....	....	5132
SHEET AND STRIP						
(Aluminum Coated) Low Carbon Deep Drawing, Annealed, Cold Rolled	1010	....	....	....	....	5036
Cold Rolled	1010	....	....	....	....	5040B
Half Hard	1010	....	....	....	....	5042B
Cold Rolled	1020	AN-S-11	....	....	....	5044
Cold Rolled	1025	AN-S-11	....	....	....	....
Annealed	1070	....	47S27a	....	....	5120
Annealed	1095	AN-QQ-S-688-1	....	....	....	5121
Hard	1095	....	....	....	....	5122
WIRE						
Zinc Coated—Soft		AN-QQ-W-435-3	....	....	....	5033
Zinc Coated—Hard		AN-QQ-W-429-1	....	....	....	....
Annealed Uncoated	1020	....	....	....	....	5032
Music Wire—Commercial	1060	....	....	....	....	5110
Music Wire—Best Quality	1090	AN-QQ-W-441-3	....	....	....	5112B
Heat Treated	1070	....	47S4g	....	....	5116A
TUBING						
Seamless—Annealed	1010	....	....	....	....	5080A
Welded—Annealed	1010	....	....	....	....	5053
Seamless	1025	AN-WW-T-846-1	....	....	....	5075
Welded	1025	AN-T-4-1	....	....	....	5077
SHEET AND STRIP						
0.55Ni, 0.5Cr, 0.2Mo	NE 8630	AN-S-12-2	....	....	....	6358A
0.55Ni, 0.5Cr, 0.25Mo	NE 8735	AN-S-22-1	....	....	....	6357A
	NE 8740	....	....	....	....	6358
1.8Ni, 0.8Cr, 0.25Mo	4337	....	....	....	....	6359
1 Cr, 0.2 Mo	4130	AN-QQ-S-685-4	....	....	....	6350
	4135	AN-QQ-S-686-1	....	....	....	6352A
	4137	....	....	....	....	6353
1 Cr, 0.15 V	6150	....	....	....	....	6455A
Low-Alloy High Tensile 75,000 T.S.		AN-QQ-S-676-1	....	....	....	....
WIRE						
1 Cr, 0.15 V Spring Wire	6150	....	48-7A	....	EMS 20a-1	6460
Annealed	6150	....	....	....	W-42	....
TUBING, SEAMLESS						
0.55Ni, 0.5Cr, 0.2Mo						
Annealed	NE 8630	AN-T-15-2	....	....	....	....
Normalized	NE 8630	AN-T-15-2	....	....	....	6530A
125,000 T.S.	NE 8630	AN-T-15-2	....	....	....	....
150,000 T.S.	NE 8630	AN-T-15-2	....	....	....	....
180,000 T.S.	NE 8630	AN-T-15-2	....	....	....	....
0.55Ni, 0.5Cr, 0.25Mo						
Annealed	NE 8735	AN-T-22-2	....	....	....	....
Normalized	NE 8735	AN-T-22-2	....	....	....	6535A
125,000 T.S.	NE 8735	AN-T-22-2	....	....	....	....
150,000 T.S.	NE 8735	AN-T-22-2	....	....	....	....
180,000 T.S.	NE 8735	AN-T-22-2	....	....	....	....
1.8Ni, 0.8Cr, 0.25Mo	4337	....	....	....	M-491-1	6413
1 Cr, 0.2 Mo						
Annealed	4130	AN-WW-T-850a-1	....	....	....	....
Normalized	4130	AN-WW-T-850a-1	....	....	....	6360A
For Machining	4130	....	....	....	....	6371
125,000 T.S.	4130	AN-WW-T-850a-1	....	....	....	6361
150,000 T.S.	4130	AN-WW-T-850a-1	....	....	....	6362
180,000 T.S.	4130	AN-WW-T-850a-1	....	....	....	6363
Annealed	4135	AN-WW-T-852a	....	....	....	....
Normalized	4135	AN-WW-T-852a	....	....	....	6365
125,000 T.S.	4135	AN-WW-T-852a	....	....	....	6366
150,000 T.S.	4135	AN-WW-T-852a	....	....	....	6367
180,000 T.S.	4135	AN-WW-T-852a	....	....	....	6368
200,000 T.S.	4135	AN-WW-T-852a	....	....	....	6369
For Machining	4140	....	....	....	....	6381
TUBING, WELDED						
0.55Ni, 0.5Cr, 0.2Mo						
Normalized	NE 8630	AN-T-33-1	....	....	....	6550A
124,000 T.S.	NE 8630	AN-T-33-1	....	....	....	....
150,000 T.S.	NE 8630	AN-T-33-1	....	....	....	....
180,000 T.S.	NE 8630	AN-T-33-1	....	....	....	....
1 Cr, 0.2 Mo	4130	AN-T-3	....	....	....	6510

Preferred Specifications for Aeronautical Steels
National Emergency Steel Specifications (NESS)
(continued)

Corrosion Resistant Steels

General Trade Designation		Government Specifications: Army-Navy Aeronautical and Federal	Army and Navy	Army Air Forces	Navy Bureau of Aeronautics	SAE Aeronautical Material Specifications (AMS)
BARS AND FORGINGS						
18Cr, 8Ni	Type 301	AN-QQ-S-771-4 Composition G	....	....	....	....
18Cr, 8Ni, 3Mo	Type 316	AN-QQ-S-771-4 Compo. MCR	....	....	....	....
16Cr, 2Ni	Type 431	AN-QQ-S-770-2	....	....	....	....
13Cr, Free Machining	Type 416	QQ-S-763a Class 6	....	....	....	5610A
13Cr, 1.5Ni	Type 414	....	....	AC 10080A	....	5615A
17Cr	Type 440	QQ-S-763a Class 10	....	....	....	5630A
17Cr, Free Machining	....	....	....	....	....	5632
18Cr, 8Ni, Free Mach.	Type 303	AN-QQ-S-771-4 Compo. FM	....	....	....	5640A
18Cr, 8Ni, Swaging	....	....	....	....	....	5641
18Cr, 8Ni, Heat Resistant	Type 321 and Type 347	QQ-S-763a Class 8	....	....	....	5645B
13Cr	Type 420	....	57-107-13	....	....	....
Cr, Ni, W, Mo; Valve	....	....	....	....	EMS 12a	5700
Cr, Ni, Si; Valve	....	....	....	....	EMS 11a	5705
Cr, Si, Ni; Valve	....	....	....	....	....	5710
SHEET AND STRIP						
18Cr, 8Ni; Heat Resistant	Type 321 and Type 347	AN-QQ-S-757-3	....	....	....	5510B
18Cr, 8Ni, 3Mo	....	AN-QQ-S-772a Compo. NCR	....	....	....	....
18Cr, 8Ni	Type 304	QQ-S-766a Class 1	....	....	....	....
18Cr, 8Ni Deep Forming	Type 302	....	....	....	....	5515A
18Cr, 8Ni; Cold Rolled, Annealed	Type 302	AN-QQ-S-772a Composition G	....	....	....	5516A
18Cr, 8Ni; Cold Rolled 125,000 T.S.	Type 302	AN-QQ-S-772a Composition G	....	....	....	5517A
18Cr, 8Ni; Cold Rolled 150,000 T.S.	Type 302	AN-QQ-S-772a Composition G	....	....	....	5518A
18Cr, 8Ni; Cold Rolled, 175,000 T.S.	Type 302	AN-QQ-S-772a Composition G	....	....	....	....
18Cr, 8Ni; Cold Rolled 185,000 T.S.	Type 302	AN-QQ-S-772a Composition G	....	....	....	....
WIRE						
18Cr, 8Ni; Welding	Type 347	....	46R2c	AC 10286B	....	5680
18Cr, 8Ni; Annealed	Type 302	....	....	....	....	5685A
18Cr, 8Ni; Spring	Type 302	....	....	....	....	5688A
18Cr, 8Ni, 3Mo Spring	Type 316	AN-QQ-W-423-1	....	....	....	....
TUBING						
18Cr, 8Ni; Welded (Hydraulic Systems)	Type 301	AN-T-43	....	....	....	....
18Cr, 8Ni; Seamless (Exhaust Systems etc)	Type 347 and Type 321	AN-WW-T-858-1	....	....	....	5570C
18Cr, 8Ni; Welded (Hydraulic Systems)	Type 347 and Type 321	AN-T-43	....	....	....	....
18Cr, 8Ni; Welded (Exhaust Systems etc)	Type 347 and Type 321	AN-WW-T-861-2	....	....	....	5575B
18Cr, 8Ni; Flexible (Exhaust Systems etc)	Type 347 and Type 321	AN-T-14-1	....	....	....	....
18Cr, 8Ni (Structural)	Type 302	AN-WW-T-855-1	....	....	....	....

Alloy Steels

Because of the excess supply of alloy steel scrap and the shortage of alloy-free steel scrap, compositions which may be produced from alloy scrap are most preferred. Similarly the two-alloy types are preferred over the single alloy types.

General Trade Designation		Government Specifications: Army-Navy Aeronautical and Federal	Army and Navy	Army Air Forces	Navy Bureau of Aeronautics	SAE Aeronautical Material Specifications (AMS)
BARS, RODS AND FORGINGS						
0.55Ni, 0.5Cr, 0.2Mo		....	46S32 Int.	....	....	....
	NE 8615	....	....	....	....	6270A
	NE 8617	....	....	....	....	6272A
	NE 8620	AN-S-13a	....	....	....	6274A
	NE 8630	AN-S-14a	....	....	....	6280A
0.55Ni, 0.5Cr, 0.25Mo						
	NE 8735	AN-S-15a	....	....	....	6320A
	NE 8740	AN-S-16a	....	....	....	6322A
105,000 T.S.	NE 8740	....	....	....	....	6325A
125,000 T.S.	NE 8740	AN-S-16a	....	....	....	6327A
3Ni, 1Cr, 0.10Mo						
Light Section	NE 9310	....	....	....	....	6260A
Heavy Section	NE 9310	....	....	....	....	6262A
	NE 9313	....	....	....	....	6263A
	NE 9317	....	....	....	....	6264A
1.8Ni, 0.8Cr, 0.25Mo						
	4337	....	....	....	....	6412A
	4340	AN-QQ-S-756a	....	....	....	6415A
1.8Ni, 0.25Mo						
	4615	....	46S32(Int.)	AC 10240	....	6290B
	4617	....	....	....	....	6292B
	4620	....	....	....	....	6294B
	4635	....	....	....	EMS 69	6310A
	4640	....	....	....	EMS 69	6312A
105,000 T.S.	4640	....	....	....	....	6315A
125,000 T.S.	4640	....	....	....	....	6317A
1Cr, 0.2Mo						
	4130	AN-QQ-S-684a	....	....	....	6370A
	4137	....	....	....	....	6380A
	4140	AN-QQ-S-752a	....	....	....	6382A
1.25Ni, 0.6Cr						
	3115	....	46S32(Int.)	....	....	....
	3135	....	....	....	....	6330A
	3140	....	....	....	....	6332
105,000 T.S.	3140	....	....	....	....	6335
125,000 T.S.	3140	....	....	....	....	6337
150,000 T.S.	3140	AN-QQ-S-690-1	....	....	....	....
3.5Ni, 1.5Cr						
Light Section	3310	....	....	57-107-22AGr.1	EMS 4b-1 and EMS 5-1	6250C
Heavy Section	3310	....	....	57-107-22AGr.1		6252C
	3313	....	....		....	6253C
	3316	....	....	57-107-22AGr.2	....	6254C
1Cr, 0.15V						
	6135	....	46S25	....	....	....
	6150	AN-QQ-S-687-2	....	....	....	6448
	6195	AN-QQ-S-688-1	....	....	....	....
0.25Mo						
	4037	AN-S-9-1	....	....	....	6300
3.5Ni						
	2330	AN-QQ-S-689-1	....	....	....	....
5Ni						
	2512	....	....	57-107-18A	EMS 3b-1	6240B
	2517	....	....	....	....	6242B
1.35Cr						
	52100	....	....	AC 10243	EMS 70	....
	NE 52100A	....	....	....	....	6440A
Nitralloy						
High Strength		AN-S-19-1 Composition A	....	....	....	6470A
Free Machining		AN-S-19-1 Composition B	....	....	....	....

About SAE

Henry Ford II, new sales vice-president of Ford Motor Co., is shown speaking before the National Automobile Dealers Association Convention Jan. 25. Asserting that the post-war job of the automobile industry is "to provide a secure existence for its employees, to educate them to further progress, and to build a worthwhile product," Mr. Ford emphasized that the design of the post-war car will depend on these principles – making for scientific, evolutionary models rather than erratic, revolutionary ones

ALLAN W. READER is now connected with the Aircraft Screw Products Co., Inc., as engineering representative with headquarters in the Detroit area. He was formerly on the engineering staff of Packard Motor Car Co., same city.

WILLIAM H. WHITE, JR., who had been employed at Lockheed Aircraft Corp., Burbank, Calif., is now in the U. S. Army Air Forces, and is stationed at Sheppard Field, Tex.

JOSEPH F. MALITZ has entered the U. S. Navy, and may be reached at the Naval Training Station, Great Lakes, Ill. As a civilian, Mr. Malitz was specification engineer for the National Supply Co., Springfield, Ohio.

Howard A. Flogaus

Howard A. Flogaus, who has been with the J. G. Brill Co. in Philadelphia for five years as chief engineer, was recently named vice-president in charge of engineering. He has been identified with the motor coach industry since 1924, having been associated with the Skinner Automotive Device Co., Yellow Truck & Coach Mfg. Co., and Reo Motor Car Co.

JOHN McLEAN HILDT, JR., aerologist third class, USNR, has been transferred from the Naval Air Station at Lakehurst, N. J., to the Naval Air Station at Cape May, N. J.

PHILIP LeROY LOOMIS, a captain in the U. S. Army Field Artillery, who was stationed at Fort Bragg, N. C., may now be reached at Headquarters 257th Field Artillery Battalion, Camp Forrest, Tenn.

A. W. LAVERS, who had been chief engineer of the Automotive Division, Minneapolis Moline Power Implement Co., Min-

A. W. Lavers

neapolis, recently joined Harry Ferguson, Inc., Dearborn, Mich., as head of industrial tractor engineering. Mr. Lavers continues as chairman of TWEC.

BEN G. VAN ZEE, formerly assistant chief engineer of Minneapolis Moline Power Implement Co., has been named chief engineer, succeeding A. W. Lavers. He has been appointed to serve on TWEC.

R. G. MESCHINO, a pilot officer in the RCAF, is now stationed at Rockcliffe, Ottawa, Ont. He was formerly a technical adjutant of No. 9 Bombing & Gunnery School, Mont Joli, Que.

EDWARD S. FIFE, who is preliminary design staff weight engineer for Lockheed Aircraft Corp., Burbank, Calif., is also associate editor of *Weight Engineering*, official journal of the Society of Aeronautical Weight Engineers.

LT. JOHN I. CICALA has been transferred from the Ordnance Department, Tank-Automotive Center, Detroit, where he was project engineer of Fuels & Lubricants Section, to the Ordnance Desert Proving Grounds, Camp Seeley, Imperial, Calif.

H. M. JACKLIN is now a consulting engineer with offices at West Lafayette, Ind. He had been a professor of automotive engineering at Purdue University, same city.

HORACE L. ARNOLD, a captain in the Signal Corps, has been transferred from Fort Monmouth, N. J., to the Detroit Field Station.

RICHARD V. HICKS is now employed as an engineer with Adel Precision Products Corp., Burbank, Calif. He was formerly assistant chief engineer at Fram Corp., East Providence, R. I.

FRANK W. WELLS, formerly assistant vice-president of J. I. Case Co., Racine, Wis., is now connected with A. O. Smith Corp., Milwaukee.

HENRY SCHRECK, formerly consulting engineer for Fairbanks, Morse & Co., Beloit,

Henry Schreck

Wis., is now associated with American Locomotive Co., New York City, as consulting engineer in the Diesel Engine Division.

VINCENT G. DODDS has recently become president of Ben-Hur Products, Inc., Los Angeles. Mr. Dodds was formerly service engineer for Aluminum Co. of America, same city.

LT.-COL. C. E. CUMMINGS has been transferred from the Ordnance Department, Tank-Automotive Center, Detroit, where he was assistant chief, Specialists Unit, Engineering Section, to A. P. O. 887, c/o Postmaster, New York City.

PHILIP G. JOHNSON, president of Boeing Airplane Co., was recently honored as the 1943 "man of the year" of Seattle, Wash., by the Seattle Real Estate Board. A ceremony was prepared, and Jan. 13 was considered "Johnson Day" throughout the Washington metropolis.

Members

Col. Herbert W. Alden, director in charge of engineering of Timken-Detroit Axle Co., celebrated his 71st birthday and 38 years of service to the company Dec. 20 at a dinner tendered him by senior executives of the company. Col. Alden, chairman of the SAE Ordnance Advisory Committee, is the only member of the Society who served twice as president, once in 1912 and again in 1923. In addition to his duties at Timken he is acting as engineer consultant to the chief of Ordnance

Col. Herbert W. Alden

J. C. ARMELING has been named liaison engineer of hydraulic development for Bendix Aviation Corp., Pacific Division, North Hollywood, Calif. He was formerly an engineer for Adel Precision Products Corp., Burbank, Calif.

LT.-COL. J. A. BARCLAY, previously executive assistant, Stock Control Bureau, Ordnance Department, Tank-Automotive Center, Detroit, may now be reached at Rock Island Arsenal, Rock Island, Ill.

MARTIN J. BERLYN has been appointed vice-president in charge of engineering of American Bosch Corp., Springfield, Mass. Although he had been connected with the Dominion Engineering Works, Ltd., Montreal, for the past 15 years, latterly as manager and chief engineer of the Diesel Engine Division, Mr. Berlyn also served as squadron leader and chief technical instructor of the School of Aeronautical Engineering of the RCAF, and only recently terminated his service there.

Martin J. Berlyn

HENRY GEORGE LEINER, formerly in the Aviation Engine Plant of Buick Motor Division, General Motors Corp., Melrose Park, Ill., is now a research engineer for Walker Mfg. Co., Racine, Wis.

MAJOR LESLIE F. ZSUFFA, formerly assistant transportation officer, Transportation Corps, Headquarters Second Service Command, A. P. O. 4111, c/o Postmaster, New York City, is now with the Civil Affairs Division, Headquarters, AEF, A. P. O. 757, c/o Postmaster, New York City.

HERBERT REINHARDT, who had been an instructor for the U. S. Army Air Forces Technical Training School, Indianapolis, is now process engineer for P. R. Mallory Co., Inc., same city.

MAJOR EDWIN K. SMITH, formerly in the Tank Engineering Bureau of the Ordnance Department in Detroit, is now connected with the Office of the Chief of Ordnance in the same city.

DENNIS LIU, previously time study man at Houde Engineering Division, Houdaille-Hershey Corp., Buffalo, N. Y., is now employed in the experimental laboratory of Waukesha Motor Co., Waukesha, Wis.

GLENN L. MARTIN, president of Glenn L. Martin Co., and first president of the National Aircraft War Production Council, and **GUY W. VAUGHAN,** president of Curtiss-Wright Corp., were among several contributors to "The Aviation Annual of 1944" edited by Reginald M. Cleveland and Frederick P. Graham, both on the editorial staff of the *New York Times*. Telling the story of this country's strides in aviation during the year 1943, this book, which is illustrated with 64 pages of pictures, gives such information as the true meaning of American air power; the training of Army and Navy airmen; new developments in the use of paratroops and glider troops; civil and military air transport; and the miracle of the United States' all-out aircraft production.

Declaring that we must face the future with an adequate insurance policy in rubber, **JOHN L. COLLYER,** president of B. F. Goodrich Co., Akron, Ohio, told the National Forecast Council that, "when peace comes our synthetic rubber plants will be as important to the security of the American people as they are today in the midst of war. They should not be dismantled." How much rubber production capacity should be continued in this country after the war will depend on the long-range planning of our armed forces, which may require 150,000 or more tons as a military security measure, he went on to say.

SAE members who were elected officers of the Institute of Aeronautical Sciences for 1944 include the following: **MAJOR R. H. FLEET,** consultant for Consolidated Vultee Aircraft Corp., San Diego, as president; **ELMER A. SPERRY, JR.,** vice-president of Sperry Products, Inc., New York City, as a vice-president; **CHARLES H. COLVIN,** director of the Daniel Guggenheim School of Aeronautics of New York University, as treasurer; **ROBERT R. DEXTER,** as secretary; and **LESTER D. GARDNER,** as chairman of the Council and president of the aeronautical archives.

Appointment of Henry Rowold as vice-president of Mack-International Motor Truck Corp. has been announced. He was placed in charge of national account sales in 1939, and will still continue in that capacity. He is a committee member of the Central Truck Tire Rating Board of OPA

Shop problems should be attacked more objectively than is common, **L. CLAYTON HILL,** Works Manager, Eagle Pencil Co., Inc., New York City, told the Industrial Executives Club of Newark recently in a talk on "Objectivity in Industrial Management." Formerly a vice-president of Murray Corp. and a past SAE councilor, Mr. Hill listed six steps in an objective approach as follows: (1) What is wrong? (2) Why does this trouble occur? (3) What are we going to do about it? (4) Who is going to do it? (5) When will it be done? (6) Was it done?

JOHN F. KLINE has entered the U. S. Army, and may be reached at Camp Mackall, Hoffman, N. C. He was formerly in the engineering department of Cadillac Motor Car Division, General Motors Corp., Detroit.

CHARLES O. GUERNSEY has recently resumed his position as vice-president of the J. G. Brill Co., Philadelphia, Pa. For the past 20 months Mr. Guernsey had, at the request of the Ordnance Department, been serving as technical director with the Philadelphia Ordnance District.

Previously manager of the Western Division of Matam Corp., Long Island City, N. Y., **ROBERT E. SNYDER** is now president of Snyder Research, Inc., Los Angeles.

COL. W. F. ROCKWELL has been elected a director of the First National Bank at Pittsburgh, Pa. Col. Rockwell is president of the Pittsburgh Equitable Meter Co., chairman of the board of the Standard Steel Spring Co. of Pittsburgh and of the Timken-Detroit Axle Co. in Detroit, and director of

Henry Rowold

production of the U. S. Maritime Commission, Washington.

H. T. ARCHIBALD is now general manager of Pete Grady Motor Co., Shawnee, Okla. Formerly he was head automotive adviser, U. S. Army, Civil Service, 84th Infantry Division Headquarters, Camp Howze, Tex.

L. B. NOBLE, who had been a chemist for Southwest Grease & Oil Co., Wichita, Kan., is now a development engineer for Romec Pump Co., Elyria, Ohio.

SAMUEL F. PRATT has been named vice-president of the Union Trading Co., Inc., New York City. He was previously general secretary for Pennsylvania Grade Crude Oil Association, Oil City, Pa.

JOHN A. WATKINS, a second lieutenant in the U. S. Army stationed at Camp Cooke, Calif., has been transferred from the Infantry Reserve to the Ordnance Department.

B. W. WETHERBEE, formerly manager of research of Glove Woven Belting Co., Inc., Buffalo, N. Y., is now technical service manager for American Resinous Chemicals

B. W. Wetherbee

Corp., with headquarters in Peabody, Mass. He has been actively associated with the rubber industry, and was one of the organizers of the Buffalo Rubber Group, of which he was chairman in 1943.

LT.-COL. WILLIS S. WELLS may be reached at the Ordnance Service Command Shop, Los Angeles, where he is commanding officer. Col. Wells was formerly at Fort Ord, Calif., in the Ordnance Department.

PAUL WILLIAMS, who had been factory manager for Lawrance Engineering & Research Corp., Linden, N. J., is now connected with Continental Aviation & Engineering Corp., Detroit.

SYDNEY G. TILDEN, JR., a corporal in the U. S. Army Air Forces, has been transferred from Miami Beach, Fla., to A. P. O. 634, c/o Postmaster, New York City.

C. M. KALTWASSER has joined Fruehauf Trailer Co., Detroit. He was formerly connected with the U. S. Army, Detroit Ordnance District, assigned to the Tank Bureau.

LOUIS REZNEK may be reached at A. P. O. 9511, c/o Postmaster, New York City. Before going overseas, he had been at Company C, Maintenance Battalion, Sixth Armored Division, Camp Cooke, Calif.

Paul W. Polk

Paul W. Polk, vice-president of Sheffield Corp., Dayton, has been granted a leave of absence to accept a commission as lieutenant (jg) in the U. S. Navy. Mr. Polk had been in charge of field distribution and engineering for the company

Formerly sales manager for William Bal Corp., Newark, N. J., **SIDNEY ROBERT MILBURN** is now connected with Heyer Products Co., Inc., Belleville, N. J.

KARL BEAVER, a lieutenant (jg), USNR, is now at the Bureau of Aeronautics, Navy Department, Washington. In private life he was research engineer for Ethyl Corp., Research Laboratories, Detroit.

LOUIS E. GAINES is now a first lieutenant in the U. S. Army Air Forces, connected with the 54th Air Base Squadron, Lawson Field, Fort Benning, Ga. He had been sales engineer for Standard Oil Co. of Pa., Phila.

CORP. FREDERICK L. BRASH, formerly a student at Company A, Fort Belvoir, Va., is now with the H & S Company, 1305th Engineers, Camp Sutton, N. C.

GLENN L. NAUGLE, who had been an aeronautical engineer for Fairchild Aircraft Division, Hagerstown, Md., is now affiliated with the Aircraft Development Corp., a subsidiary of the Engineering & Research Corp., Riverdale, Md.

WALTER F. BENNING, previously bus engineer for Mack Mfg. Corp., Allentown, Pa., is now in charge of engineering of jeeps and commercial vehicles at Willys Overland Motors, Inc., Toledo, Ohio.

C. W. FLOSS has resigned from General Detroit Corp., where he was chief engineer, to join the Detroit Gear & Machine Division of Borg-Warner Corp. as gear engineer.

Previously research engineer for Chrysler Corp., Detroit, **LUDGER E. LaBRIE** is now chief engineer for Hydraulic Brake Co., same city.

ROLAND W. STEPHENSON is now an ensign, O-V(S), USNR, stationed at Fort Schuyler, The Bronx, N. Y. He was formerly with North American Aviation Inc., Inglewood, Calif.

Limitations which have prevented flight from becoming a means of universal private travel – engine failure, landing fields and weather – are worries that the helicopter, or Stout-designed SkyCar, will relegate into the past. The "direct lift or descent" ability of this combination airplane and automobile, which will be used as family flivvers, aerial taxis to take airline passengers from airports to a city rooftop or park, or as 2-ton trucks to serve a multitude of pickups and delivery needs, reduces the most serious obstacles to inconvenience rather than risks. The significance of this air power on the post-war world is foretold by **WILLIAM B. STOUT,** SAE past-president and head of Stout Research Division of Consolidated Vultee Aircraft Corp., and **Franklin M. Reck,** Detroit editor for *Aero Digest,* in their recently-published book "Tomorrow We Fly." The authors' predictions of the low cost of future air express, the airplane's effect on other products, and what international travel will be like, lead them to an inevitable conclusion – that the ubiquitous powers of aviation and its continued progress are stepping-stones to world colonization.

SAE members who attended the round-table conferences of the Army Ordnance Association at the Waldorf-Astoria Hotel, Jan. 19, included: **K. T. KELLER,** president of Chrysler Corp.; **IRVING BABCOCK,** president of GMC Truck & Coach Division, General Motors Corp.; and **C. F. KETTERING,** directing head of Research Laboratories Division, General Motors Corp.

Among guest speakers who were at the five-day sales conference of the WHIZ Automotive Division of R. M. Hollingshead Corp., Camden, N. J., in mid-December, was SAE member **W. K. TOBOLDT,** editor of *Motor Age.*

CAPT. A. D. C. STRICK has been transferred from the Royal Army Ordnance Corps to the Royal Electrical & Mechanical Engineers, Fourth Armored Brigade Work Shops, British Middle East Forces.

LT. J. E. SCHIPPER, JR., formerly stationed at Pedricktown, N. J., with the 303rd Ordnance Regiment, may now be reached at A. P. O. 9420, c/o Postmaster, San Francisco.

ROBERT N. DOBBINS, a lieutenant in the U. S. Navy, is commanding officer at the Naval Auxiliary Air Station, Quillayute, Wash. He was formerly at the Naval Air Station in Seattle.

MATTHEW URY, who was in the U. S. Army as a captain in the Ordnance Department, Black Hills Ordnance Depot, Provo, S. D., has resumed his duties as proprietor of Auto-Lectric Distributors, New York City.

LT.-COM. H. KNOX PERRILL, USN, may be reached at Naval Air Station, Navy No. 14, c/o Fleet Post Office, San Francisco, Calif. He was formerly stationed at Pearl Harbor, T. H.

HARRY I. HAZZARD, previously development engineer for Briggs & Stratton Corp., Milwaukee, is now associated with McCulloch Aviation, same city, as an engineer making aircraft auxiliary engines and developing light plane engines and helicopters.

EDWARD A. SUTHERLAND, a second lieutenant in the U. S. Army Air Forces, is now attached to Combat Crew Headquarters, Blythe, Calif.

CHARLES M. **EDMONDS,** formerly salvage engineer, sheet metal subassembly, Beech Aircraft Corp., Wichita, Kan., is now assistant ground engineer for Alexander Film Co., Colorado Springs, and radio serviceman for Manitou Electric (Radio Division), Manitou Springs, Col. Mr. Edmonds is also enrolled as a physics major at Colorado College.

IRVING S. RIGHTER, who had been superintendent of transportation, N. J. State Police, West Trenton, N. J., is now a sergeant in the U. S. Army, stationed at Camp Endicott, Davisville, R. I.

Formerly an engineer for Kinner Motors Inc., Glendale, Calif., **JAMES W. WHITTLESEY** is now an ensign in the U. S. Navy.

LT. ALAN H. YATES, USN, has been transferred from Utility Squadron Four, Naval Air Station, Norfolk, Va., to Utility Squadron 16, c/o Fleet Post Office, New York City.

LEE OLDFIELD now is president of the Laboratory Equipment Corp. at Mooresville, Ind. The new company manufactures engine laboratory equipment, including special

Lee Oldfield

purpose engines. Mr. Oldfield was recently associated with Merz Engineering Co. as chief engineer and has long been active in SAE affairs. He is a past-chairman of the Indiana Section.

In his newly-published manual for aircraft flight crews, entitled "Airplane Performance and Operation," **R. DIXON SPEAS,** assistant vice-president of engineering, American Airlines, Inc., LaGuardia Field, N. Y., explains the science of getting the most out of an airplane. This involves determining the conditions of engine operation that will produce a given desired result, and of determining what can be done both with the engine and airframe, without infringing upon the desired margins of safety. Illustrative examples sketched for specific aircraft of types that are in wide current use are, as **EDWARD WARNER,** vice-chairman, Civil Aeronautics Board, says in the introduction, "as valuable to pilots seeking the means of self-instruction as for use as a text in the organized training of new transport pilots." Drawings of gremlin characters which are interspersed throughout the pages give a pleasantly humorous quality to an otherwise technical handbook.

WILBUR R. VESTER has been transferred from Amarillo, Tex., to Flight 1, Squadron 2, St. Cloud, Minn.

Robert R. Hirsch

Robert R. Hirsch, previously district manager of SKF Industries, Inc., Philadelphia, is now director of sales of Bunting Brass & Bronze Co., Toledo, Ohio. Walter C. Ahlers has been appointed to the position from which Mr. Hirsch resigned

EDWARD A. PRIJATEL has entered the U. S. Army Air Forces, and may be reached at Squadron E, Flight 1, George Peabody College, Nashville, Tenn. In civilian life he was a draftsman for Pesco Products Co., Cleveland.

RALPH J. TEETOR, president of Cadillac Malleable Iron Co., Cadillac, Mich., was recently nominated president of the American Foundrymen's Association, and **FRED J. WALLS,** metallurgist for International Nickel Co., Inc., Detroit, was nominated for the vice-presidency. Both offices are for one year terms.

E. S. CHAPMAN is now vice-president and general manager of Clayton Mfg. Co., Alhambra, Calif. He was formerly vice-president of production, Plymouth Division, Chrysler Corp., Detroit. Mr. Chapman also served as deputy chief of industrial service in the Office of the Chief of Ordnance, Washington. Mr. Chapman is a past SAE vice-president for Production Activity.

H. EDWIN FULTZ, an air cadet in the U. S. Army Air Forces, has been transferred from the Air Crew at the University of Chattanooga, in Tennessee, to Columbus Army Air Field, Columbus, Miss.

M. D. GRUSH, a first lieutenant in the U. S. Marine Corps, has been transferred from San Francisco to H & S Company, Fifth Marine Division, Camp Pendleton, Oceanside, Calif.

O. A. RADERMACHER, previously principal automotive adviser for the Second Army, Camp Gordon, Ga., is now automotive adviser at Headquarters, 20th Army Corps, Ordnance Section, Camp Campbell, Ky.

HENRY C. REINBERG, who had been a chemical engineer and supervisor of CFR Department Units, State of Louisiana Department of Revenue, Baton Rouge, La., has joined J. S. Abercrombie Co., Sweeny, Tex.

JAMES C. M. YOU, previously research translator and economist for the Army Map Service, Corps of Engineers, Washington, is now economist and research man of the China Unit, Department of the Interior, same city.

SAE members in the Armed Forces who have received recent promotions are: **E. L. CUMMINGS,** Ordnance Department, Detroit, to colonel; **J. RUSSELL WALSH,** U. S. Army Air Forces, Headquarters, First U. S. Army Group, A. P. O. 655, c/o Postmaster, New York City, to lieutenant colonel. Raised to major were **DONALD M. HAMILTON,** U. S. Army Air Forces, Air Service Command, Patterson Field, Fairfield, Ohio; **HAROLD W. CLOUD; WILLIAM N. HITE, E. Q. BECKWITH,** Lima Tank Depot, Office of Chief of Ordnance, Lima, Ohio; **ANDREW S. CURETON,** A. P. O. 750, c/o Postmaster, New York City, and **NATHANIEL ELY.** Promoted to captaincy were **WILLIAM K. BENNETT,** Ordnance Department, New York Port of Embarkation, Brooklyn, N. Y.; **PHILIP B. ROCKWOOD,** Ordnance School Automotive Section, Aberdeen, Md.; **A. G. BARTLETT,** Office of Quartermaster General, War Department, Washington; and **KNIGHT S. CARSON,** U. S. Army Air Forces, Materiel Command. Wright Field, Dayton. **ROBERT L. DOUGLAS,** Motor Transportation Officer, Headquarters, 772nd AAA Gun Battalion; and **FRED B. HUNT** were raised to first lieutenant, while **ROBERT C. HAMILTON,** Engineering Division, Wright Field, Dayton, was commissioned a second lieutenant.

In the Navy **OTTO E. SZEKELY,** production superintendent, Philadelphia Navy Yard; and **W. E. LARNED,** Naval Air Station, Patuxent River, Md., were made commanders. **HUGO EDWARD GILLE,** University of Tenn., Martin, Tenn., was promoted to lieutenant, as was **GRAY FARR,** Amphibious Training Command, Naval Operation Base, Norfolk, Va. **ROBERT L. ADAMS,** who was made lieutenant (jg), is at Barnes-Gibson-Raymond Division, Associated Spring Corp., Detroit.

SAE members who have received recent changes in company status are: **S. F. HUNT,** Chandler-Evans Corp., South Meriden, Conn., from project engineer of fuel pumps systems to chief carburetor engineer in charge of engineering and development of fluid flow control devices; **HOMER JESSE WOOD,** AiResearch Mfg. Co., Inglewood, Calif., from design engineer to assistant project engineer; **A. M. SCHEERER,** Wright Aeronautical Corp., Paterson, N. J., from experimental engineer to engineering manager in charge of administration and execution of all engineering functions; **C. F. GRAFFLIN,** Embry-Riddle Co., Miami, Fla., from general manager of the engine overhaul department to technical assistant to general manager of Aircraft & Engine Division; **F. W. MOORE,** Wright Aeronautical Corp., Paterson, N. J., from resident inspector of the British Air Commission to British technical representative to the U. S. Army Air Forces; **ALBERT A. PREVOST,** Mack Mfg. Corp., Plainfield, N. J., from metallurgical engineer to research engineer; **RINALDO BRUN,** National Advisory Committee for Aeronautics, Cleveland, from assistant mechanical engineer to mechanical engineer; **H. C. AKERBERG,** Macmillan Petroleum Corp., New York City, from di-

vision manager in Los Angeles to eastern division manager; **JOHN W. VOTYPKA,** War Production Board, from head industrial specialist of the Production Service and Smaller War Plants divisions of the Detroit regional office to manager of the production department; and **FRED BOATRIGHT,** Naval Air Station, Corpus Christi, Tex., from supervisor to general foreman of Engine Overhaul Division.

Intra-company changes which have taken place among SAE members in Lawrance Aeronautical Corp., Linden, N. J., formerly Lawrance Engineering & Research Corp., include: **CHARLES L. LAWRANCE,** from president and chief engineer to chairman of the board and director of engineering research; **EDWIN H. OLMSTEAD,** from chief experimental engineer to project engineer; and **GEORGE H. STRAM,** from checker to design checker.

COL. P. H. ROBEY, who is in the U. S. Army Air Forces, has been transferred from the Experimental Engineering Section, Power Plant Laboratory, Wright Field, Dayton, Ohio, to Marietta Air Base, Marietta, Ga.

JOSEPH G. ROSE has moved from San Antonio, Tex., where he was in Squadron 109, Flight E, to Blackland Field, Waco, Tex., where he will receive advance pilot training.

WILL DAMMANN, president of Bear Mfg. Co., Rock Island, Ill., is a member of the executive committee of the Motor & Equipment Manufacturers' Association for the current year.

AB JENKINS, mayor of Salt Lake City, Utah, who is internationally famous for the many world's automobile records he established on the Bonneville salt beds in Utah, was a guest of honor at a luncheon given by the Automobile Old Timers, Inc. at the Hotel Roosevelt, New York City, Feb. 3.

O. K. WILSON, formerly senior design engineer for Emerson Electric Mfg. Co., Turret Division, St. Louis, Mo., is now connected with Northrop Aircraft, Inc., Hawthorne, Calif.

WILLIAM D. LEWIS is now an ensign, USNR, and may be reached at U. S. Naval Engineering Experimental Station, Annapolis, Md. He had been test engineer for American Locomotive Co., Auburn, N. Y.

ROYCE CHILDS, who has been promoted to a captain, is stationed at Battalion Headquarters, Maintenance Battalion, A.P.O. 252, c/o Postmaster, New York City.

J. S. KLEINBERG, formerly a student at Purdue University, is now at the U. S. Naval Academy, Annapolis, Md.

BRUNO SCHROETER, previously chief engineer of O. & S. Bearing Co., Detroit, is now associated with Pressed Metals of America, Inc., Port Huron, Mich.

SAE members who participated in round-table discussions of engineering and shop problems at the Second War Production Conference at the Hotel Statler, Buffalo, Feb. 28, were **NORRIS C. BARNARD,** general chairman, joint engineering committee, Colonial-Beacon Oil Co.; **W. L. BATT,** vice-chairman, War Production Board; **GERVASE M. MAGRUM,** co-chairman, joint engineering committee, Houde Engineering Division; and **O. ARNOLD HANSEN,** Linde Air Products Co.

SAE student members newly engaged in engineering work at various production plants throughout the country include:

	Formerly at	Employed by
R. W. GERMOND	A. & M. College of Texas	North American Aviation, Inc.
CHARLES R. URSELL, II	A. & M. College of Texas	Pan American Airways
VERNON E. ROBBINS	Illinois Institute of Technology	Foote Bros. Gear & Mach. Corp.
JAMES PORTER	Ohio State University	General Motors Diesel Division
DALE BENDER	University of Wisconsin	Allis-Chalmers Mfg. Co.

OBITUARIES

Ernest E. Wilson

Ernest E. Wilson, director of General Motors Proving Ground, died Jan. 22 at the age of 45. Active in the Society since he became a member in 1937, Mr. Wilson was SAE representative on the ASA Sectional Committee of Standards for Inspection of Motor Vehicles in 1941, and served as vice-president representing Passenger Car Activity in 1942. Before joining General Motors in 1928, he spent two years at the NACA laboratories in Langley Field, Va. Service in the Signal Corps during World War I postponed Mr. Wilson's graduation from Iowa State College until 1925, when he received a B. S. degree. He had also attended the University of Wisconsin.

William B. Mayo

William B. Mayo, former chief engineer of Ford Motor Co., and more recently president of the Chicago, Duluth & Georgian Bay Transit Co., died Jan. 31 at the age of 78. Having been connected with the Hooven-Owens-Rentschler Co., manufacturers of heavy machinery for over 30 years, Mr. Mayo joined the Ford organization in 1913. He designed that company's River Rouge factories, supervised construction of Ford ore carriers, was largely responsible for Henry Ford's initial entry into the aircraft industry, and approved virtually every outstanding development project of the company.

Following his retirement from the Ford company in 1933, he served for a time as president of United Aircraft Corp. Mr. Mayo was also governor of the National Aeronautical Association and a director of Transcontinental Air Transport, Inc.

Amos F. Moyer

Amos F. Moyer, design research engineer of tractor chassis at International Harvester Co., died recently at the age of 58. Mr. Moyer graduated from the University of Minnesota in 1910 with a degree in mechanical engineering, and seven years later became a member of the SAE.

Elmore E. Woods

Elmore E. Woods, 28, died Sept. 16 as the result of a motorcycle accident. A student at New York University at the time of his death, Mr. Woods expected to receive his degree in mechanical engineering this year.

Mason P. Rumney

Mason P. Rumney, 60, mayor of Grosse Pointe, Mich., since 1939, and vice-president and director of Detroit Steel Products Co., died recently. An ardent boating fan, Mr. Rumney successfully competed in many races, the most famous of which was the Bermuda race of 1934, a 650-mile run from New London, Conn., to Gull Light, Bermuda. A graduate from the University of Michigan, he was a former president of the U. of M. Club of Detroit and later of the U. of M. Alumni Association. In 1927 he was elected president of the Detroit Railway & Harbor Terminal. Mr. Rumney, who has been a member of the SAE since 1912, served as a major in the Ordnance Department in World War I, and was an SAE councilor for 1924-25.

David L. Gallup

David L. Gallup, for 20 years an engineer with Bendix Aviation Corp., died after six months' illness Jan. 2 at the age of 65. Graduating from Worcester Polytechnic Institute in 1901, Mr. Gallup became a professor of mechanical engineering there, doing extensive research in gasoline engineering. He joined Nordyke & Marmon in 1917, where he helped develop the Liberty airplane engine used in World War I. After freelancing for several years, he became connected with Bendix in 1923, and devoted all of his time to that company until his death.

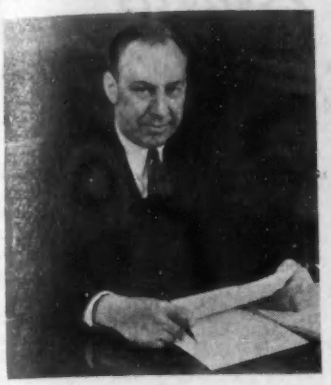
Leo Drobig

Leo Drobig, 55, general manager of Dick Du Bois, Inc., died Oct. 9. After having attended St. Johns College and Kings College in London, England, his native country, and the College of Technology in Saxony, Germany, Mr. Drobig was employed in various automotive engineering capacities both abroad and in the United States. He had been a member of the SAE since 1927.

James R. Hughes

James R. Hughes, engineer for Woodall Industries, Inc., died Nov. 30. He was 55 years old. Born in Liverpool, England, he was made chief body engineer of Ford Motor Co. soon after arriving in this country, and remained with that organization for 13½ years. He then joined Studebaker Corp. and for the next 5½ years was employed there in the same capacity. He became a member of the SAE in 1932.

Minneapolis-Moline Promotions



Ben G. Van Zee

William E. Swenson

Ben G. Van Zee, formerly assistant chief engineer of Minneapolis Moline Power Implement Co., has been named chief automotive engineer, succeeding A. W. Lavers. Mr. Van Zee has recently been appointed a member of the SAE Tractor War Emergency Committee. William E. Swenson, who had been engaged in agricultural and industrial engine design, is the new assistant chief automotive engineer at Minneapolis Moline

WILLIAM H. BECK, formerly superintendent of delivery, Sherwood Bros., Inc., Baltimore, is now an electrical engineer for Doughnut Corp. of America, Ellicott City, Md.

LEO ALBERT GILL, who had been an automotive technician for the Department of Public Safety in Pittsburgh, has been named superintendent of motor vehicles for the same department.

CAPT. CLARK A. FISHER, U. S. Army Air Forces, has been transferred from Tonopah, Nev., where he was connected with Supervisory Unit No. 4, B & G Range, to San Francisco, where he is with Headquarters, Fourth Bomber Command.

J. O. McREYNOLDS has left the Cleveland plant of Thompson Products, Inc., where he was test engineer, to take charge of the company's fuel systems laboratory at Inglewood, Calif.

RICHARD JOHN MOFFETT, previously production manager for De Havilland Aircraft Co. of Canada, Ltd., Toronto, Ont., is now chief engineer and sales manager for Canadian Propellers, Ltd., Montreal, Que.

JOHN J. O'DONNELL, a staff sergeant in the U. S. Army, has been transferred from Fort Lewis, Wash., to A. P. O. 9540, c/o Postmaster, New York City.

F. J. LINSENMEYER is now employed by Stran Steel Co., Detroit, a division of Great Lakes Steel Co., as technical adviser, and he will shortly direct research work at the Michigan Steel Co. plant of the same organization.

CARROLL H. VAN HARTESVELDT has been promoted from fuels and lubricants engineer to assistant chief engineer of Ranger Aircraft Engines, Division of Fairchild Engine & Aircraft Corp., Farmingdale, L. I., N. Y.

SAMUEL P. ALTMAN, a lieutenant in the U. S. Army, may be reached at Technical Order Control Office, Production Division, Wright Field, Dayton.

HARRY R. JACOBSON, who has been promoted to a major in the U. S. Army, is stationed at the Monmouth Signal Corps Procurement District at Bradley Beach, N. J. Mr. Jacobson was one of the organizers of the Army's Tank-Automotive Center in Detroit, and was assigned to the Purchases Division of the Army Service Forces Headquarters in Washington before being transferred to Ft. Monmouth.

P. J. PICCIRILLI, formerly lieutenant commander, USNR, has been promoted to commander. He may be reached at U. S. Industrial Chemicals, Inc., 60 East 42nd Street, New York, N. Y.

R. J. MINSHALL, president of PESCO Products Co., recently announced the promotions of **JAY M. ROTH,** previously chief engineer, to director of engineering of pump and automotive departments and **JOHN A. LAUCK,** formerly chief test engineer, to chief engineer of pump department.

Memorial Committee Appointments Made

THE SAE Council has approved the appointments for a three-year term of R. M. Hazen to the Manly Memorial Medal Board of Award, with N. N. Tilley continuing to serve for one year more and A. T. Gregory for two; G. A. Page, Jr. to the Wright Brothers Medal Board of Award, with William Littlewood continuing for one more year and J. L. Atwood for two; and L. C. Lichty to the Harry L. Horning Memorial Award Committee, with W. M. Holaday remaining with one more year to serve and W. G. Ainsley with two.

Piston, Ring Nomenclature Approved as SAE Standard

THE Piston and Piston Ring Nomenclature report (*SAE Journal*, November, 1943, p. 39) has been approved by Council, upon the recommendation of the SAE General Standards Committee. The nomenclature has already received enthusiastic acceptance by the piston and ring manufacturers, SAE Headquarters reports.

TRACTOR

Fuels for Post-War Is Now TWEC Project

SAE Tractor War Emergency Committee has started study looking toward recommendations for post-war tractor fuels considered desirable by tractor engineers. Special subcommittee of TWEC appointed to study this problem is sponsored by TWEC member W. F. Strehlow, Allis Chalmers Mfg. Co. Chairman of the subcommittee is A. W. Pope, Jr., Waukesha Motor Co., and members are: D. P. Barnard, Standard Oil of Ind.; J. M. Davies, Caterpillar Tractor Co.; C. M. Larson, Sinclair Refining Co.; Elmer McCormick, John Deere Tractor Co.; and T. M. Risk, Ethyl Corp.

Collecting Opinions

The new subcommittee is gathering opinion from all members of the tractor and engine industry as a basis for discussion of desirable post-war octane numbers for tractor fuels, fuel specification possibilities and allied problems.

W.E.B. Probes Differing Army-Civilian Truck L-Order Requirements

WPB's recent authorization of the manufacture of a substantial number of civilian trucks in 1944 has brought into sharp focus the differing requirements for civilian and military motor vehicles established by limitation orders now in effect. As a result, the SAE War Engineering Board has organized a committee under the sponsorship of B. B. Bachman, Autocar Co., and with R. F. Sanders, Chevrolet Motor Division, GMC, as chairman, to study this problem and to make recommendations.

Study Limitation Orders

The differing limitations now in effect on the use of critical materials in military and civilian equipment obviously present a serious problem in the production of the large numbers of army and commercial vehicles scheduled for this year since the limitations require in many cases the use of different materials in the same part. Also, in many cases, the end use of a vehicle is not known at the time of its manufacture and hence, for example, if it is made to civilian requirements and ultimately scheduled for delivery under lend lease, modifications would be necessary to meet specifications.

The whole problem is being studied by the W. E. B. committee, which had its first meeting on Jan. 14, with a view to providing the best technical answers which automotive engineers can provide, consideration being given technical needs, production engineering angles and the conservation of critical materials. The work of this committee is regarded as of particular importance because of the pattern it may set for the handling of similar problems as peace approaches.

Rambling Through Section Reports

(The news Section meetings which appears on this and the following page was originally scheduled for publication in the February issue, but had to be held over due to the extended space necessary to cover the 1944 SAE War Engineering-Annual Meeting.)

STRIKING the gavel at BALTIMORE SECTION'S "Winterization" meeting Dec. 16, where R. L. Weider's cold starting experiences were bared, was Past-Chairman of Philadelphia Section Adolph Gelpke . . .

How new synthetic fuels have widened the automotive horizon, how they were discovered and how they are produced were outlined by George H. Freyermuth, Standard Oil Co. of N. J., at Dec. 15 CANADIAN SECTION meeting. Asserted that a higher quality fuel will be available after the war for motor vehicles despite unprecedented demand for aviation gasoline for civil purposes . . . Past-Section Chairman and Past-SAE Councilor C. E. Tilston acted as technical chairman . . . Annual turkey draw among 147 attending amounted to $115.50 for British War Victims' Fund . . . Two days previously Mr. Freyermuth told NEW ENGLAND SECTION that it is production of large quantities of 100 octane gasoline which is setting Allies on the road to victory, and compared its power with poor fuel used by World War I pilots. Sound movie, "Power and Octane," amplified his talk . . .

Revealing "inside" war news at same NE meeting, Lt. Frank Sweeney exhibited film recently captured from Germans, "Nazi Bomber Attack on Allied Convoy" . . . showed a gas tank aboard ship hit, men injured and lost, and odds facing our Blue Jackets . . . Armed Forces well represented, with marine and sailor describing events in combat zones . . .

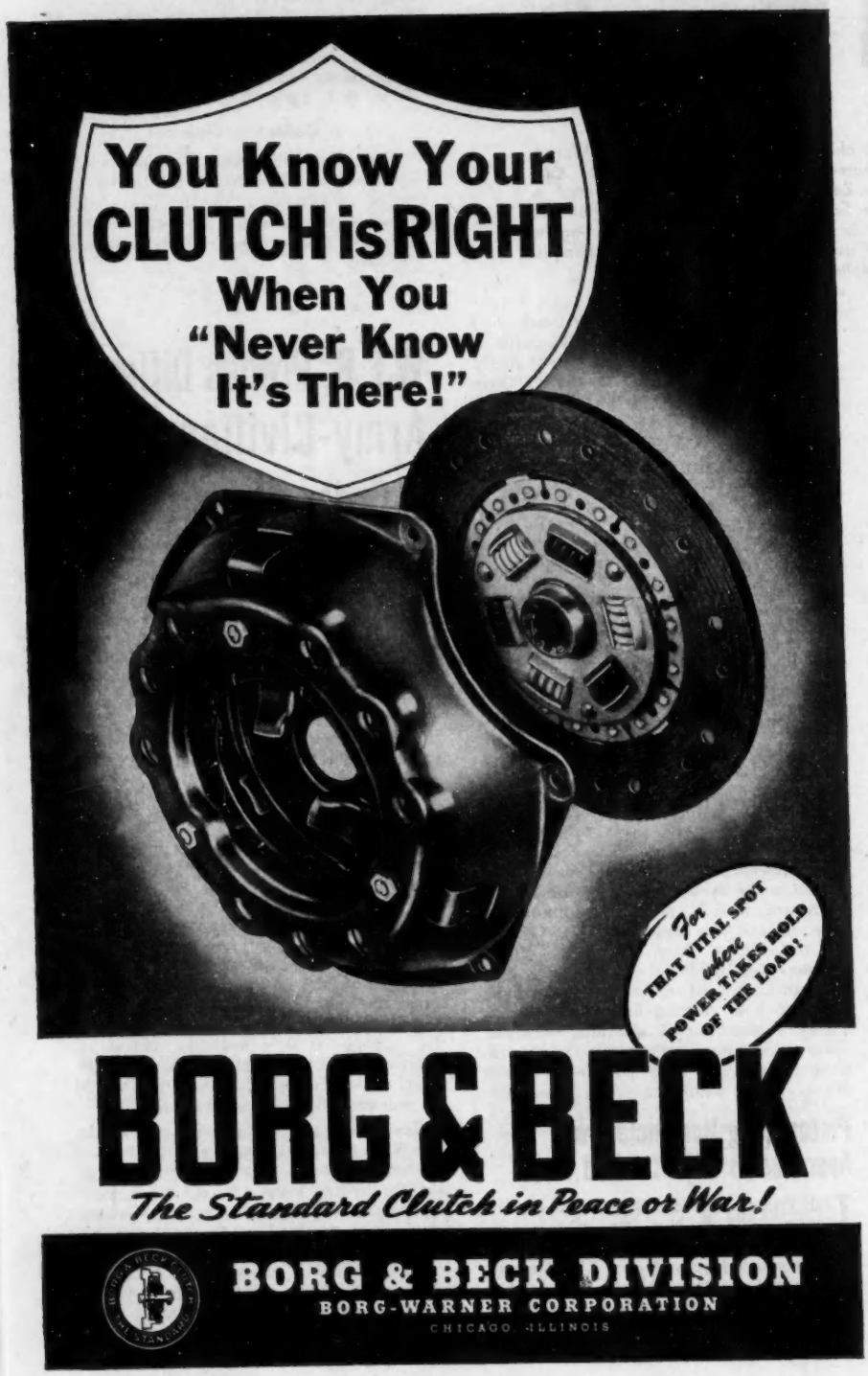
Proxying for A. T. Colwell as principal speaker at KANSAS CITY SECTION'S Dec. 14 meeting was Paul Johnson, Thompson Products, Inc. . . . Noted guests were Valencio A. DeBarros of Brazil and Steve Rawley, Civil Aeronautics Administration . . . War film, "Bombers over North Africa," concluded session . . .

Captured enemy aircraft equipment, including enemy engine parts, self-sealing fuel tanks, and other material never before shown to public by the Army displayed at Jan. 6 aircraft meeting of METROPOLITAN SECTION . . .

Hollister Moore, SAE's manager of Sections & Membership Departments, drafted as coffee speaker at MILWAUKEE SECTION'S Nov. 3 meeting . . . commended Section on having obtained 119% of membership allotment . . . Dinner served to 100 of 130 who came to hear H. N. Landis' talk.

Symposium of four transportation and maintenance papers held at Dec. 13 meeting of NORTHERN CALIFORNIA SECTION . . . "Eliminating Down Time with Available Motor Bearing Materials," by Harold Rice, Pioneer Motor Bearing Co., dealt primarily with problems of bearing man in keeping automotive equipment running under present conditions where loads are greater and maintenance procedures poorer . . . indicated that materials for bearings are now being used which should have been discarded three years ago, although more satisfactory alloys for bearing shells have been promised . . .

Replacing C. R. Talmage as chairman of SOUTHERN OHIO SECTION is John F. Haines, former vice-chairman of Section . . . Mr. Talmage officially turned over reins at



Dec. 13 meeting, at which Col. H. F. Gregory, AAF, discussing "Helicopter Facts," described development of various helicopter designs, with special attention to Sikorsky XR-4 . . . expects price of a small two-passenger craft to be in range of expensive car after the war, while family size plane will cost considerably more . . . facts pointed out in motion picture of helicopters were: tips of rotor blades travel at a speed of 350 mph; a helicopter may carry 6000 lb load; cruising speed of 100 mph is anticipated . . .

Illustrating his talk on "Economical Application of Rolling Bearings to Farm Machinery," with slides, George W. Curtis, Timken Roller Bearing Co., confined his subject at TWIN CITY GROUP'S Dec. 10 meeting to four topics: (1) proper methods of handling bearings, (2) importance of designing applications to provide simplified and economical machining of parts, (3) importance of using proper methods of assembling parts, and (4) importance of proper lubrication and protection from dirt and corrosive material . . .

Feature at Dec. 16 meeting of MUSKEGON CLUB was talk on "This Age of Cargo Flight," by Paul E. Burbank, United Air Lines Transport Corp., who, in his discussion of future air transportation, said four types of planes are being developed: two 4-engine planes carrying between 75-100 passengers, with a cruising speed of 260 mph, and two 2-engine planes, carrying cargo and passengers, with a cruising speed of 210 mph . . .

Toastmaster at luncheon meeting of PITTSBURGH SECTION Nov. 23, which more than 100 attended, was Wendell A. Stone, Pan American Oil Co., who declared that oil refiners have broken down their prejudices against competitors to further war effort . . .

Describing the Tocco process as a high-frequency induction-heating process which produces ideal surface hardening without distortion or scale formation, Dr. H. B. Osborne, Jr., Ohio Crankshaft Co. told ST. LOUIS SECTION Dec. 14 of contribution by this process to war production. Originally developed to aid in the manufacture of crankshafts, it has also been applied to other engine parts, and has been used successfully in making munitions for bringing out the desirable physical properties in armor piercing shells, cartridges, aerial bombs and bullets of all sizes . . . A slide film, "Bearings Carry the Load," explaining what designers and operators can do to get longest possible bearing life, followed the talk . . . Section remained first in membership campaign for November . . .

The character of the war is changing from tank to truck production, audience of 100 students of CCNY Student Branch learned Nov. 26 . . . Aircraft diesels topic of Dec. 8 meeting, with A. L. Bayles, Rogers Diesel & Aircraft Co. pointing out that main advantage of this type of engine over gasoline engine is reduced fire hazard as well as better fuel economy. The reason they are not yet used for aircraft, he says, is that they are too heavy and too small . . . Pros and cons of "Seaplane Transport" cited at Dec. 17 meeting by Emil K. Harvey, American Export Airlines . . . Complications include increased cost in handling, as seaplanes do not land under own control but must be aided by motor boats, beaching crew and tractors, and also are dependent on the weather . . . advantages is elimination of need for large and costly airports . . . Plywood as a structural material also has its good and bad points, according to A. J. Perna, Fairchild Engine & Airplane Corp. Its disadvantages, students were told Dec. 15, are tendency to absorb moisture, warp or shrink in use, and inability to withstand high bearing loads. Its advantages are higher strength-weight ratio and fatigue-resistance than most structural materials . . .

Elections and movies high points of Nov. 23 DETROIT UNIVERSITY SB meeting . . . Fred P. Van Dame named vice-chairman, Gerald L. Black, secretary, and Warren Reuter, treasurer . . . Films were fair representation of United Nations "British Commandos in Action," "Report from Russia," and "Yanks Bomb Tokyo." . . .

Officer elections at OHIO STATE SB on Nov. 26 too. Robert R. Hyatt, chairman, Lawrence E. Skeen, vice-chairman, and Roland V. Fisch, secretary-treasurer.

And look to the Bendix* Drive for fast, dependable starts

Soldiers driving amphibian jeeps are enthusiastic in their praise. They're telling their buddies that they intend to own one of these amazing land-sea cars when the war ends. And doubtless, the amphibian jeep is but *one* of *many* revolutionary, new vehicles that will appear on the scene after the peace. But there's one point on which you can set your mind at rest. The famous Bendix Drive, adapted to practically every type of war vehicle, will meet any demand growing out of the post-war years. Yes, regardless of engineering changes, you can look to the Bendix Drive to continue to deliver fast, dependable starts.

The Bendix Drive is an important member of "The Invisible Crew"—precision equipment which more than 30 Bendix Plants from coast to coast are speeding to our fighting crews on world battle fronts.

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ECLIPSE MACHINE DIVISION

Rambling Through Section Reports

DIFFERENCES between performance of power machinery bearings and diesel engine bearings described at BALTIMORE SECTION by L. M. Tichvinsky of Naval Experimental Station, Annapolis, Feb. 10 . . . showed how operation of latter bearings is affected by pressure, temperature, speed, selection of bearing alloys and lubricating oils and by design, manufacture and maintenance . . .

Turnout of 146 members and guests attended CANADIAN SECTION'S Jan. 19 meeting to hear Neil P. Petersen's views on "Fifth Freedom – The Right to Work." (Digest appears on p. 32 of this issue) . . .

Serving as technical chairman at CHICAGO SECTION Tractors & Industrial Power Meeting Feb. 8 was Howard S. Manwaring, International Harvester Co. . . . Salient features of L. B. Sperry's discussion of farm power and post-war tractor at same session were: fuel situation and its influence on future construction; long-range aspect of tractor types, sales field, and so forth; influence of tank and other war machines on tractor designs; and entry into the tractor field of war producers of tanks and trucks . . . Mr. Sperry, of International Harvester, who illustrated talk with lantern slides, is a member of the SAE National Tractor War Emergency Committee and the Tractor & Farm Machinery Activity Committee . . .

Akron-Canton Meeting of CLEVELAND SECTION Feb. 28 preceded by social half hour was a review of research and development of synthetic rubber, presented by Dr. Ray P. Dinsmore, Goodyear Tire & Rubber Co. . . . explored early post-war possibilities as well as technical and economic aspects of substitutes . . .

Ford's Dale Roeder has become DETROIT SECTION vice-chairman in charge of Placement Committee . . .

First four cycles of the 2-cycle diesel engine were classified as: design and development; commercial applications, pre-war; war activities and the post-war engine by Stanley B. Tuttle, General Motors Corp., at INDIANA SECTION meeting Feb. 17 . . .

KANSAS CITY SECTION saw two restricted Navy sound films at Feb. 15 closed meeting . . . one of bombing of ships and airfields at Pearl Harbor . . . the other depicting actual combat scenes on Russian battlefront . . .

Dinner reservations for 121 made at MILWAUKEE SECTION meeting Feb. 4, where Fred G. Shoemaker, Diesel Division of General Motors Corp., showed adaptability of 2-cycle diesel engines to various types of war equipment, especially through design features of placing the camshaft and components on either side of the cylinder block, reversibility of the head and shafting . . . balance features of the engine were pointed out as being weighted cam gears rotating in opposite directions . . .

Straight facts and answers as to whether plastics, aluminum, plywood or glass bodies will be used on post-war dream cars, and whether plastics will replace non-functional and non-stressed materials automotivewise given by T. S. Carswell, Monsanto Chemical Co., at NEW ENGLAND SECTION Feb. 8 in his discussion "Plastics in War and Peace" . . .

NORTHERN CALIFORNIA SECTIONITES forgot speeches and papers Feb. 5 in favor of lighter entertainment at annual dinner dance, which had all the pre-war garnishings of formal attire, floor show, and six-course meal . . .

Pinch-hitter for Chairman Z. C. R. Hansen at OREGON SECTION Feb. 3 was Vice-Chairman J. P. Tretton, Jr. . . .

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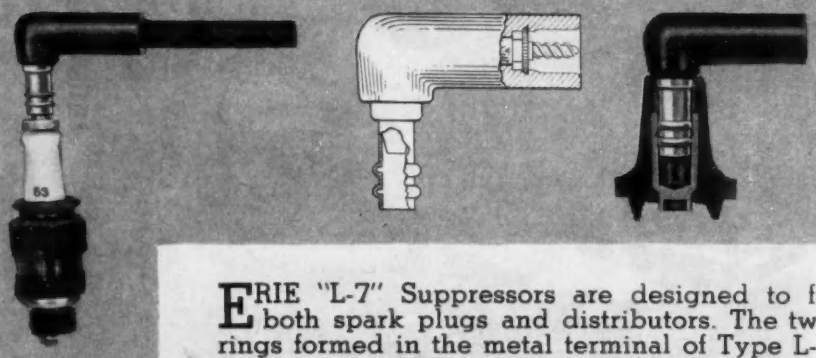

ERIE "L-7" Suppressors are designed to fit both spark plugs and distributors. The two rings formed in the metal terminal of Type L-7 Suppressors make pressure contact with the metal insert in the distributor cap, providing a firm electrical connection. Snap-pressure contact with the spark plugs and wood screw connection to the cable are vibration proof.

This feature of "universal application" permits standardization of suppressor equipment, thereby simplifying purchasing and parts stocking problems.

The efficiency and long functional life of Erie Suppressors is attested to by the fact that they stand up under the severest laboratory tests, as well as the rigorous service demands of mobile military equipment. A data sheet giving full information on Erie Suppressors will be sent upon request.

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BUY WAR BONDS

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Restricting Jan. 25 meeting to local news, PITTSBURGH SECTION featured a tripartite discussion of "Highway Adequacy" by engineers representing the state, county and city viewpoints . . . Lively debate following meeting led to conclusion that uniformity of state laws (enabling engineers to design one truck for use in all states) was highly desirable and making progress . . . difference of opinion expressed as to advantages of allowing "greater wheel loads" or building more roads each year . . . Acting chairman for evening was Bob Austin . . .

Large proportion of wear in brakes is caused by applications of much less than full power, according to Donald R. Brehm, Bendix-Westinghouse Air Brake Co., who spoke on "Foundation Braking" at Jan. 18 meeting of ST. LOUIS SECTION . . . illustrated gains attained by proper adjustment of both front and rear brakes, with special attention to their functioning at low air pressures . . . exhibit of power brake assemblies, parts and accessories displayed by Bendix-Westinghouse Air Brake Co. . . . Operating our own private family airplane for week-end cruises or for business trips is something we'll be doing after the war, Everett E. Hart, who teaches flying and physics at Parks Air College, told members at same meeting. Recommended the Ercoupe as the most promising design developed, which incorporates a high degree of safety along with utility, performance and economy . . . Section reports 42 applications for membership received up to Dec. 31, as compared to total of nine for same period last year . . .

Properties, fabrication, present and future applications of magnesium alloys analyzed at SOUTHERN OHIO SECTION'S first light structural metals meeting of the season Jan. 21 by Walter J. Klayer, Aluminum Industries, Inc. . . . Season's first marine automotive engineering meeting in Dayton Feb. 16 featured story of PT boats – their design, manufacture, operation and history, as far as censorship would allow . . . New vice-chairman for Dayton is Lt.-Col. Clyde H. Mitchell of U. S. Army Air Forces, succeeding John F. Haines, now chairman. Charles L. Hall became Membership Committee chairman . . .

To produce high output engines per pound of weight it will be necessary to use valve-in-head design to get good breathing, idea set forth by Carl T. Doman, Aircooled Motors Corp., at MOHAWK-HUDSON GROUP Jan 4 in his paper on post-war powerplants for personal airplanes and automobiles . . . Compression ratios can be increased, with no breathing troubles, by using larger bores and shorter strokes . . . A bore of 3¼ in., a stroke of 2½ in., and an engine of 7000 rpm will have piston speeds no higher than in present engines . . .

Octane number of post-war gasoline will be about four points higher than pre-war type . . . belief expressed by George K. Squier, Standard Oil Co. of Ind., at MUSKEGON GROUP Jan. 27 . . . Discredited 100 octane gasoline as uneconomical, and stated only practical method of making higher octane gasolines after the war is catalytic cracking process . . . lead will also be used because it is the cheapest way known to increase octane number . . . Predicted big motor oil seller will be premium grade, heavy-duty detergent type containing additives . . . Lithium soap-type greases also a future possibility . . .

Women are outnumbering men 9 to 1 in efficient production of cylinder heads for aircooled radial engines, according to M. J. Gregory, factory manager of Caterpillar Tractor Co.'s Foundry Division, who told PEORIA GROUP Jan. 31 of wartime's call on women . . .

Officers elected by CCNY Student Branch for spring term are: Seymour Deitchman, president; Seymour Lieblein, vice-president; Burtron Rosenbaum, treasurer; and Bernard Shaffer, secretary . . .

Trip through Buick Forge Plant comprised Jan. 19 meeting of GENERAL MOTORS INSTITUTE SB . . . members first were served dinner (they vouched they had steaks, pre-Pearl Harbor brand), and then heard discussions on production problems . . .

Officers elected at PURDUE UNIVERSITY SB for 1944 were: Robert B. Batchelor, chairman; Paul Zmola, vice-chairman; and Edward G. Pita, secretary-treasurer . . . Membership drive brought favorable results . . .

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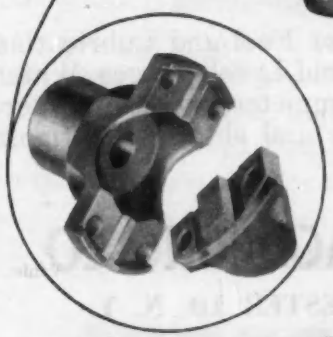

— you will reduce *runout* to a minimum. The pilot in MECHANICS joints is ground to fit into the corresponding pilot in the yoke. The yoke is turned from the bore, thus maintaining concentricity. Our engineers are ready to show you how this and other MECHANICS advantages will benefit your new and improved models.

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APPLICATIONS Received

The applications for membership received between Jan. 10, 1944, and Feb. 10, 1944, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Baltimore Section: George Michael Buda, Erle J. Hubbard, Henry A. Warburton, Jr.

Buffalo Section: Clark L. Hastings, Robert J. Marble, B. L. McCarthy, John A. Piedmont, F. D. Townsend, Jerold L.

Canadian Section: Thomas W. Hardy, George Wakefield Herr, Frank G. King, Charles Ira Lathrem, Frederick William Lewis, William R. Werther, Henry Hotson Wilson.

Chicago Section: John W. Anderson, William F. Arnoldy, Myres Z. Delp, William A. Horthy, Albert H. Kelso, Harold C. Keysor, Joseph Lencki, Garnet P. Phillips, Llewellyn W. Welch.

Cleveland Section: John M. Borland, J. Robert Branstetter, Fred T. Buzard, Lee C. Daniels, Harold F. Enyeart, Thomas A. Frischman, Walter G. Hildorf, Robert L. Johnson, A. F. Ilacqua, Bruce H. Multhaup, F. Ralph Schuricht, Joseph J. Scorzo, Stephen G. Scott, Warren A. Silliman, Roger B. Statford, Richard Horst Zimmerman.

Colorado Group: John F. Van Buskirk, Oscar Guy Byers, Dale F. Frey, Willard H. Jones, Walter C. Nelson.

Detroit Section: Robert L. Adams, Edward Sylvester Barnum, William J. Bird, Edward U. Blanchard, Arthur L. Bradley, Ernest D. Bushong, David Ross Calhoun, Bruce D. Caulkins, Robert W. Colburn, R. E. Cook, V. A. Crosby, William O. Eastman, Charles E. Edwards, Harry Elmer Fidler, Delbert C. Flemming, Joseph G. Gagnon, J. William Glueckert, Harold C. Hatch, Donald M. Higgins, Gene Hirsch, V. C. Hoover, Don A. Howland, Edwin W. Hubbard, Robert C. Hupp, Charles Wm. Irwin, Jr., Joseph Jandasek, Carl F. Joseph, Robert H. Lamb, Frederic A. Leisen, E. Lesher, Harvey W. Lipke, Wallace C. Manville, Thomas Timothy May, Claude M. Metelski, Edwin B. Munson, William J. Parducci, J. George Penn, Michael J. Plawchan, F. T. Rowland, Henning William Rundquist, Ludwig F. Schiele, Harry G. Schwab, Alfred E. Tennant, Chester Winston Waters, C. Emmett Zwahl.

Indiana Section: E. O. Ashley, John L. Buehler, C. Dixon Eagle, Harold H. Lurie.

Kansas City Section: Thomas Herbert Sandbrook.

Metropolitan Section: William James Clark, Benjamin A. Cooper, Thomas L. Counihan, Putnam Davis, Arthur H. Deacon, Nicholas F. DeMinco, Lester T. Dennis, George H. Doerries, Norman J. Edelmann, Harold Gershinowitz, Marshall Edward Lenning, John G. McNab, Charles S. Miller, Beal P. Moore, J. Gordon Ogilvie, Peter Hasbrouck Palen, Robert W. Reid, Orrin E. Ross, Wendell J. Sanders, Rowell A. Schleicher, George Dickinson Thayer, Russell S. Thompson, Robert G. Troth, Donald J. Wahler.

Milwaukee Section: Reynold M. Anderson, Craig W. Cannon, James W. Cleary, George K. Dreher, Arthur S. Lewis, W. H. Naegley, Charles W. Wheatley, George W. Zabel.

Muskegon Club: Albert W. Demmler, Alvin L. Maring, Herbert M. Shuman.

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Northern California Section: Robert H. Garnot, Theodore Heil, E. G. Jackson, Lewis Llewellyn Lindamood, E. V. Parker.

Northwest Section: Hearld Engle, Raymond Dudley Sollars.

Oregon Section: A. M. Perley.

Peoria Group: Elmer Isgren, Ralph Joseph King.

Philadelphia Section: Kenneth W. Anderson, Gerald Lewis Bader, Robert E. Brumbach, Otto K. Duhrkoff, Gerald E. Mintz, E. W. Timper, George I. Tull, Gerald R. Wynne.

Pittsburgh Section: C. A. Burkhalter, Thomas E. Eagan, Robert L. Kirkpatrick, Howard M. Smith, Thomas G. Stitt, Blaine B. Wescott.

Southern California Section: Julius H. Blohm, Clifford H. Collins, Elmer H. Cook, Harry O. Davis, Jr., Paul M. Devendorf, Joseph H. Famme, James E. Gonzales, Joseph Owen Hopper, Owen C. Kent, Floyd T. Melton, Roger R. Tierney, Herbert L. Trautmann, Henry Rene Velkoff, Theodore A. Woolsey.

Southern New England Section: Ernest J. A. Greenwood, Jr., Kenneth M. Silcock, Ernest Tucker, United States Time Corp.

Southern Ohio Section: Warren D. Berkley, Morton Brooks, John R. Diver, J. Luke Hoffman, Richard E. Moore, Theodore F. Olt, Curtis M. Varland.

Syracuse Section: Harold Lewis Cullings, Carlton H. Rinehart.

Texas Section: Samuel Parran Card, Roy S. Lee, F. P. Sewell.

Washington Section: Harold Julian Muddiman, Daniel C. Walser.

Wichita Section: Major Vincent Amos.

Outside of Section Territory: Vincent J. Bonina, Albert T. Bremser, Cyril A. Crumpler, C. K. Donoho, William R. Fleming, Clifford O. Kiser, Harrison F. Lambkin, Judson B. Lyles, Steve J. Majestic, John T. Menietto, Robert Twells.

Foreign: William Ernest Headon, England, David John Joyce, Australia, John Francis Johnston, New Zealand, James Denning Pearson, Scotland, Thomas Guy Slater, England.

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between Jan. 10, 1944, and Feb. 10, 1944.

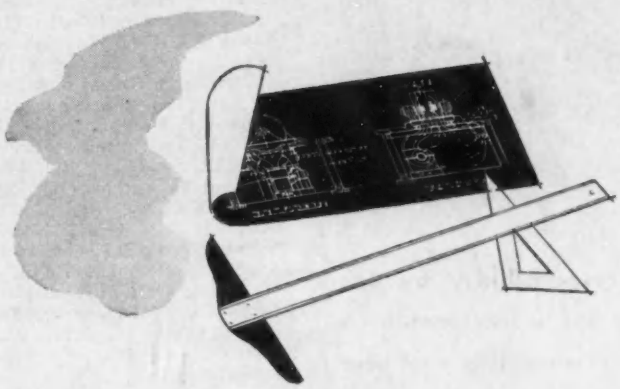
The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Baltimore Section: Carl Gorman (A), Prosper L. Kinsella (A), Howard R. Niggles (A), Bartholomew Frank Quintilian (M), Paul J. Siebert (A), Walter S. White (A).

Buffalo Section: Lawrence N. McKenna (J).

POST WAR

PLANNING



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Cleveland Section: Homer D. Barto, Jr. (J), George W. Becker (M), Paul D. Brodie (J), Joseph J. Brown (M), Wallace A. Christianson (J), Ralph L. Couch (A), Robert W. Daykin (M), Richard M. Downing (J), Elmer I. Franson (A), Donald C. Guentert (J), M. Russel Jacobs (J), Ray L. Johnson (J), Samuel R. Kassouf (M), Wallace W. Leipner (M), Rex D. McDill (M), Edward G. Pekarek (J), Parnell J. Porter (A), Harry B. Shaper (M), Elgin Lawrance Shaw (M), Richard Sibley Shetter (J), James C. Sweger (A), Robert Ernest Willison (J), Seth Brokaw Wise (J), Carlton L. Zink (M).

Detroit Section: George Eugene Adams (J), David I. Babitch (J), W. E. Biggers (A), Frank C. Burrell (J), Robert K. Christie (A), James H. Clark, Jr. (J), John T. Denny (J), Francis S. Driscoll (J), Charles E. Ervin, Jr. (J), Robert W. Gaines (J), Laurence W. Gauthier (J), Henry T. Gieryn (J), R. H. Hensleigh (J), H. Hintzen (J), George E. Holton (M), Max F. Homfeld (J), Thomas L. Jackson (J), John E. Kaake (J), Roy George LaGrant (J), Thomas J. Marshall (A), J. L. McCloud (M), Robert W. Miner (J), Paul M. Nash (J), Henry J. Paulsen (J), John V. Peters (J), Earl Riebe Pierce (M), John Polomski, Jr. (J), William G. Reid (A), Brig. George MacLeod Ross (FM), Henry Frederick Schultz (J), Cecil R. Sessions (J), Paul C. Skeels (A), Oscar L. Sokol, Jr. (J), Charles H. Stanard (M), Augustin J. Syrovy (M), Joe H. Talley (M), John Joseph Uicker (M), Fred E. Ullery (M), Ernest W. Upton (J), Wilfred Lewis Was (J), Maurice Moses Zuckerstein (J).

Indiana Section: Justin Blay (M), Maurice Bookout (A), William S. Castle (J), Wallace Lumpkin (A), William C. Penzel (J), Richard E. Smith (A), Hobert L. Wilson (M).

Kansas City Section: Whitney M. Kerr (A).

Metropolitan Section: 2nd Lt. Samuel P. Altman (J), Henry Balfour (J), William E. Bates (J), William N. Davidson, Jr. (A), Robert Dunn (A), Walter Eickele (A), John J. Franzman (A), Charles Gellman (J), William Grunhof, Jr. (A), Philip V. Haddad (J), Charles L. Huisking, Jr. (A), Buford W. Hulfish (M), Alfred K. Huse (J), Dean W. Johnston (A), John Karanik (J), Frederick C. Kent (A), Herman G. Koch (A), F. Gerard Lake (M), Sigmund Lisbon (M), Warren Joseph Lockmuller (J), William C. Mearns (M), Harry Miner (A), Andrew B. Ott (A), Frederick C. Picut (A), Charles A. Rheinstrom (A), John B. Richey (A), John Drake Rogers (J), Harry Ruben (A), Frank C. Russ (A), William F. Russell (A), Henry Schirokauer (M), George E. Scott (M), William M. Simpson (A), K. E. Sutton (M), Richard F. Teeling (A), Theodore J. Zeller (M), Charles V. Zimmermann (A).

Mid-Continent Section: R. K. Adams (M), Walter W. Willson (A).

Milwaukee Section: Spencer L. Clope (M), Robert C. Kleinow (A), Rene J. Steckel (M), John W. Weaver (A), Leroy Alonzo Wilson (M), R. H. Wolff (M).

Mohawk-Hudson Group: Edward E. Berg (A).

Muskegon Club: Albert J. Lundwall (M).

New England Section: Thomas F. Gallagher (A), Earl N. Hatch (A), William S. Horgan (J), George D. Rosekelly (A), Arthur W. Wanzer (M).

Northern California Section: A. G. Baxter (A), Andre S. Damiano (A), Richard C. Holroyd (A), Donald Kay Kirkbride (A), Joe Lyon, Jr. (M), Raymond G. Peterson (J), L. Dean Roulund (M), Edward H. Santos (A), D. Sulprizio (M).

Northwest Section: Erle Baine (A), John F. Conner (A), Clarence Adren Dyer (A), W. R. Hubka (M), William J. Miller (A), W. J. Stanaway (A), Robert Waldo Teel (J), Zotique W. Therrien (A), A. Wheeler Warren (J).

Oregon Section: Lt. (jg) Ralph M. McCugh (J), Rupert E. Perry (J), (Mrs.) Maybelle R. Pointer (A).

Peoria Group: Eugene L. Helton (J), Robert Eugene Kennemer (J), Norman M. Nelson (J), Roger M. Smith (J).

Philadelphia Section: Albert E. Howell, Jr. (J), John S. Killaly (A), Lt. Jack G. Kuhrts (A), Lawton B. Logan (A), Harry A. Schneider, Jr. (A).

Pittsburgh Section: Ray Mansmann (A), James H. McCrady III (A).

St. Louis Section: Harry H. Bidwell (M), J. B. Codlin (J), William Wallace Cornman (M), Douglas W. Erskine (M), Robert Davis Philbrick (J), David Rinkema (J), William Frank Smith (A), Michael Toth (M), George William York (A).

Southern California Section: Wayne H. Allen (M), W. Andrew Ashton (M), Rufus H. Barrett (A), Charles S. Batterson (A), Paul K. Beemer (M), Reginald Burrows (A), Verne G. Casaretto (J), John Robertson Clifton (J), Craig H. Edwards (M), George E. Fetterman (A), Robert W. Goedhart (J), Lewis Ralph Grant (J), Melvin A. Hanson (J), William D. Hemenway (A), John M. Hoch (A), L. W. Hollingsworth (M), Lee M. Holmes (A), M. W. Irvine (A), Alvin L. Johnson (A), Cecil Leff (J), Thomas F. Morrissey (M), Para-

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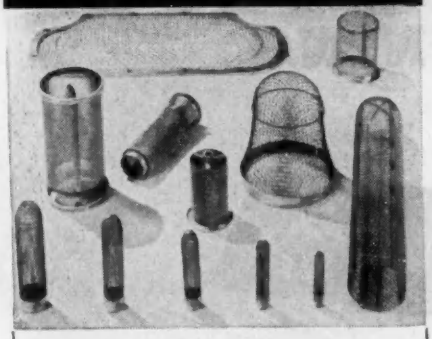

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Foreign: Phillip Draper (F M), (England), James Norman Kirby (F M), (Australia), Zala Cromer Tatton (FM), (New Zealand).

Tractor Power Takeoff Standards Are Approved

APPROVAL of the revised Tractor Power Takeoff Shaftend standard, and new standard dimensions for Tractor Drawbars and their position relative to the tractor power takeoff, has been voted by Council. The work was developed by the SAE Tractor & Equipment Division, headed by W. H. Worthington.

This material will be included in the SAE 1944 Handbook.

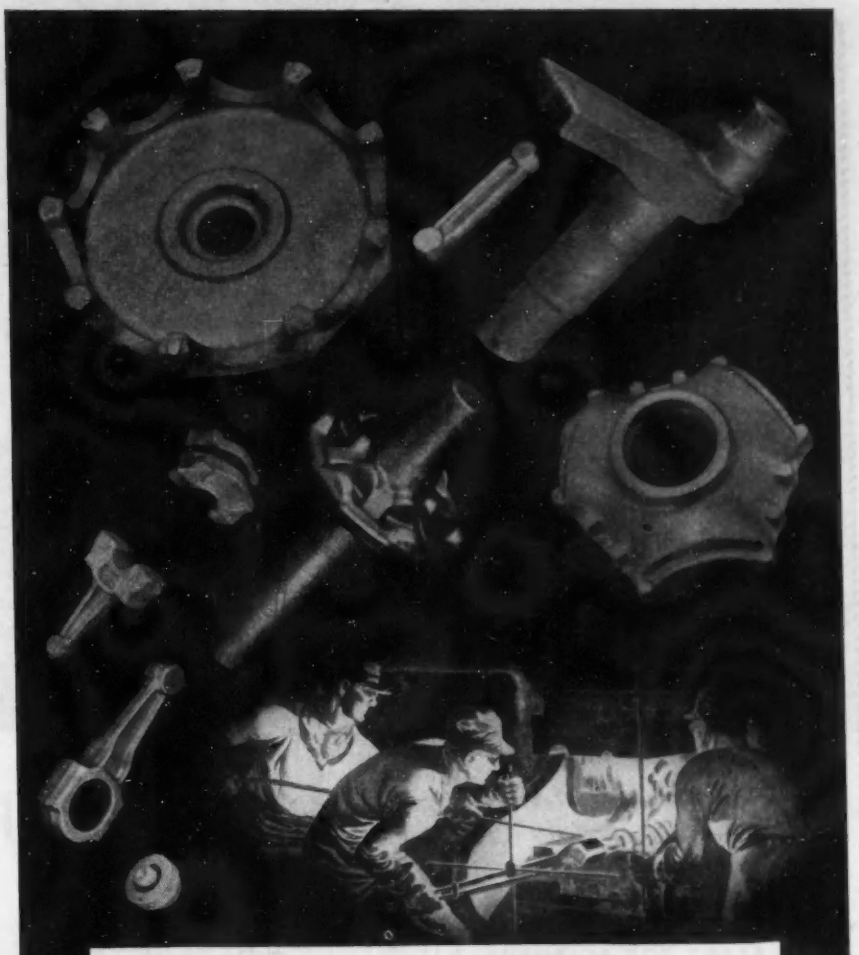
CRC, Inc.

Incorporation of Research Group Completed

INCORPORATION of the Coordinating Research Council, supported jointly by the SAE and American Petroleum Institute, was completed Dec. 13, 1943, with the filing of papers with the Secretary of State of the State of New York. The incorporators and the new board of directors met Dec. 20.

President of the board is B. B. Bachman, and the five other SAE representatives are J. M. Crawford, William Littlewood, J. B. Macauley, Jr., Arthur Nutt, and C. G. A. Rosen.

Vice-president is Dr. T. D. Delbridge and the five other API representatives are Dr. D. P. Barnard, A. Ludlow Clayden, R. A. Halloran, Dr. K. G. McKenzie, and G. G. Oberfell. Dr. R. P. Anderson is treasurer and C. B. Veal is secretary.



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$1000 Planes

cont. from p. 27

dreaming in process in most aircraft companies, of what the post-war four-place design may be like. Planes of this general type offer many advantages over current designs, but also have a large number of problems that must be solved, and some inherent disadvantages.

Discussion

GENERAL agreement was expressed that the high cost of upkeep for the private airplane must be lowered drastically before the private plane will become very popular.

Commenting on the high cost of overhauls and repairs, W. V. Hanley, Transcontinental & Western Air, Inc., remarked that there would be a field for outfits specializing in the overhaul of engines on a modified mass-production basis. Mr. Hall suggested that if sufficient planes are in operation, service stations might be justified in carrying replaceable parts for much of the plane. Peter Altman, chairman of the session, predicted that the number of skilled workers available and the excess of materials after the war would contribute to the lowering of the cost of repairs.

Questioned by Mr. Hanley as to the field for small twin-engine planes, Mr. Hall replied that the cost factor was the chief stumbling block, despite the greater safety achieved. The author explained that the reason why he had not discussed these planes in his paper was that he felt $3000 was the maximum price for which the private airplane could sell, whereas $4000-5000 is the lowest price that can be considered for twin-engine ships. He added that if engine costs could be brought down to the point where two engines could be built to sell for $600-700, then a twin-engine plane could be made to sell for $3000. It must also be remembered that having two engines adds complexity in itself, for two fuel systems and other accessories are required.

Plywood floats that can be made at less cost than the pre-war built-up floats are being developed, according to Herb Packer, *Motor Service*, who contributed this information in answer to a question by George A. Round, Technical Division, Office of the chief of ordnance. Mr. Hall suggested that if any developments that would bring the price of pontoons down to a reasonable figure should be forthcoming, private seaplanes would become more popular, as there are many areas where water is available for landing, but no airfields. The post-war Aeronca, the author assured Mr. Round, will have fittings to allow floats to be installed.

The leaf-spring landing gear being tried out by the Army is easy to produce in quantity, but it has the disadvantage of being suitable only for full cantilever and not for retractable landing gear, Mr. Hall said in reply to a question by Murray Fahnestock, Leaf Spring Institute.

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RECONDITIONING OF BRAKE DRUMS

by J. V. BASSETT

Chairman, SAE Ordnance Vehicle Maintenance Committee on "Reclamation of Parts – Brake-Drum Group"

■ ***1944 Annual Meeting***

(Excerpts from a progress report "Reconditioning Brake Drums" being prepared for the Ordnance Department)

THIS subcommittee was formed to explore the possibility of reclaiming Ordnance vehicle brake drums. The committee appreciated the necessity of reclaiming Ordnance vehicle brake drums, but it also realized the importance of a successful process to the civilian transit industry.

At our first meeting, an attempt was made to explore the various possible methods of reclaiming brake drums. The methods discussed were:

1. Sleeving or curved relines bolted or pressed into machined drums. Past experience of some of this committee's members indicated that under present-day speed and overload service conditions, this method of reclamation was not practical.

2. Centrifugally casting a new brake track into old drums was also discussed. This method, if successful, would have entailed considerable shipping time and expense in getting old drums to a foundry equipped to do centrifugal casting and their return to the using fleet. It is obvious that for Army use, this method was definitely out.

3. Rebuilding by welding, both by gas and electric arc were discussed and rejected by the committee.

4. Sprayed metal reclaiming was being investigated by ODT-SAE Committee No. 7, and it was decided that this method held greatest promise of success.

The Metallizing Engineering Co., Inc., agreed and have cooperated wholeheartedly in the preparation of brake drums for tests. Detailed reports of all test procedures and spraying methods will be included in the final report.

All the laboratory tests have, of necessity, been abusive in order more quickly to develop the condition found, and to reduce the necessary time for testing. At each stop there was absorbed in the brake drums 500,000 ft-lb of energy.

This committee concludes:

1. At the present time, the only reclamation process that holds promise of success is the sprayed metal process.

2. The higher carbon content iron is more satisfactory than the carbon-free or extremely low-carbon iron.

3. For light- and medium-duty service, reclaimed drums are, for all practical purposes, as satisfactory as new drums.

4. An undercoat of copper tends to eliminate a heat dam between the base metal of the drum and the new sprayed surface.

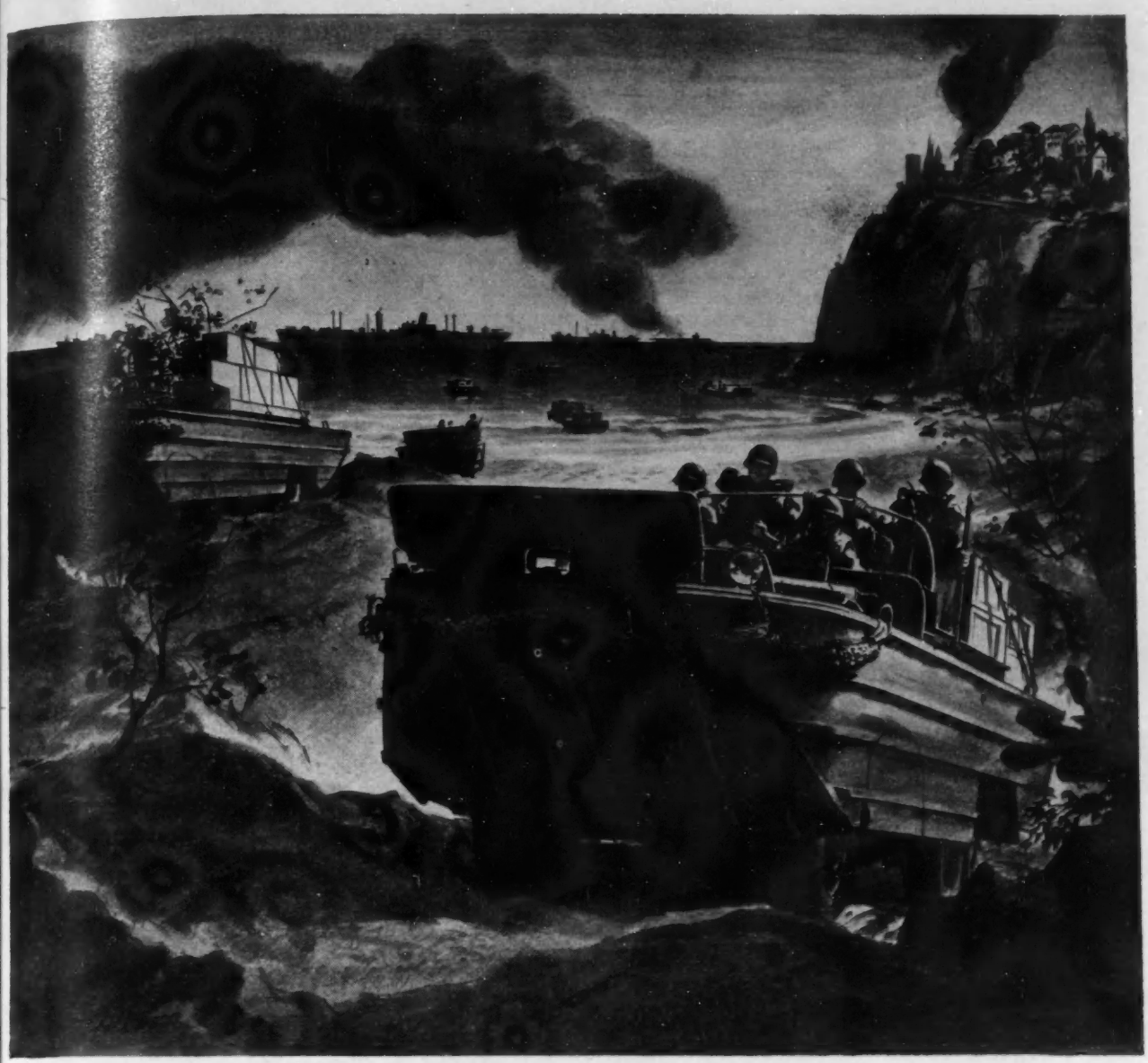
5. The method of metallizing recommended by the committee should be used. This method is not too critical nor too difficult for the average shop to perform successfully.

6. The cost of reclaiming brake drums is approximately the same or slightly less than the cost of new drums.

7. If new drums become any more scarce, this process will not only be an economic possibility, but an absolute necessity.

8. It may be within the realm of possibility that future perfection of technique and development of alloy spray metals will produce superior-wearing brake drums.

We do not believe that in the short space of time this committee has been probing this problem, the last word in either type of face metal or technique of application has been achieved. Therefore, much, much more time and many more trials must be expended on this problem. This can best be done by the civilian transit industry working in close cooperation with this committee and the early experimenters with the process toward the end goal of success. The indications are that higher carbon content may be advantageous, and the addition of free graphitic carbon should be tried.



The Truck that Barges In from the Sea

NAZI EYES POPPED in awed surprise when they first spotted our Army "ducks"... during the early Sicily and Salerno landings.

What kind of landing "boats" were these... that kept right on coming... that seemed to develop "land legs" as they hit the beach and climbed it and kept running at high speed along the roads?

Today, flocks of these "ducks" accompany our invasion forces everywhere... to deliver the tons of food, water, and gasoline needed during each landing.

Twenty-one HyattRollerBearings carry the load for each of these double-duty trucks... that "barge" in from the sea.

It takes a bearing like Hyatt to withstand such punishment... *the terrific impacts of landing and climbing, the churning of the wheels in sand and water.* Only a bearing which has precision, capacity, and toughness can handle these load extremes.

Everywhere in vital war equipment, heavily loaded shafts, gears and wheels do their jobs supremely well when they turn on Hyatt Roller Bearings.

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•

Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

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HYATT BEARINGS

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GENERAL MOTORS

Among West Coast Members at 1944 Annual Meeting

Top Row: Earl Cooper, chief automotive engineer, Sales, Union Oil Co. of Calif.; E. W. Templin, automotive engineer, Los Angeles Bureau of Power & Light; C. C. Moore, Research Supervisor, Union Oil Co. of Calif.; Earl Marks, Earl Marks Electric Service. Center Row: R. N. Reinhard, manager, Los Angeles Automobile Works, Inc.; Peter Glade, automotive engineer, Purity Stores, Ltd.; J. Verne Savage, superintendent, City of Portland, Municipal Shops & Motor Vehicle Inspection Station; R. A. Watson, factory manager, Federal Mogul Corp. Bottom Row: Z. C. R. Hansen, retail sales manager, International Harvester Co.; A. G. Cattaneo, research engineer, Shell Development Co.; E. F. Lowe, assistant general manager, SAE; Wallace Linville, chief automotive engineer, General Petroleum Corp. of Calif.; W. E. Davenport, division sales manager, Union Oil Co. of Calif.

Speeding Aid to Aircraft Repair Crews Along World-Encircling Battle Fronts

TWO days after his return from a 11,894-mile round trip from Washington to England, via French Morocco, Dakar, Brazil, British Guiana, and Puerto Rico, D. G. Moffitt, RAF (second from right), attended a special meeting of the SAE Aircraft Materials & Processes Coordinating Subdivision in New York to complete a cross index of materials specifications for the use of British and other United Nations aircraft repair crews. The index will enable mechanics to choose proper materials for making parts in the shops of the far-flung combat zones.

The project was requested of the SAE because of the inability of repair crews to determine from drawings the equivalent SAE-AMS, A-N, Federal, Army, Army Air Forces, Navy, Navy Aeronautical, British, and other commonly used specifications. Its completion will be a historic milestone in United Nations technical cooperation.

Mr. Moffitt's mission was to take the preliminary tabulations to England, obtain correlation of the specifications of the British Ministry of Aircraft Production and the Society of Aircraft Constructors, and correlate them with various American specifications compiled by the SAE group.

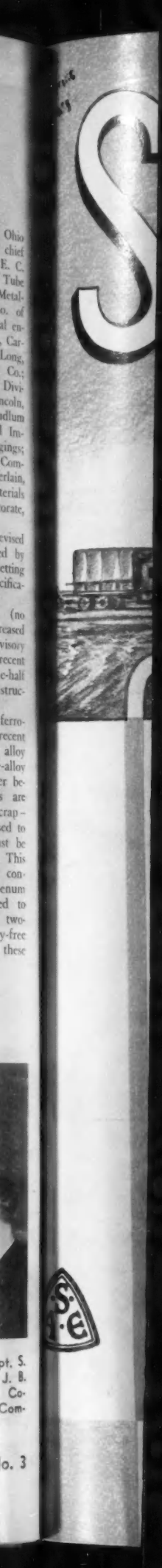
Aero Steels

cont. from p. 40

Corp.; H. R. Lewis, chief metallurgist, Ohio Seamless Tube Co.; A. J. Williamson, chief metallurgist, Summerill Tubing Co.; E. C. Wright, chief metallurgist, National Tube Co.; L. S. Bergen, associate director, Metallurgy & Research, Crucible Steel Co. of America; E. H. Davidson, metallurgical engineer, Structural, Plate-Stainless Steels, Carnegie-Illinois Steel Corp.; B. H. DeLong, chief metallurgist, Carpenter Steel Co.; H. A. Grove, metallurgist, Alloy Steel Division, Republic Steel Corp.; R. A. Lincoln, metallurgical engineer, Allegheny Ludlum Steel Corp.; A. H. Milnes, The Steel Improvement & Forge Co., Drop Forgings; J. G. Morrow, chief metallurgist, Steel Company of Canada Ltd.; H. L. Chamberlain, supply directorate, British Raw Materials Mission; F. H. Saniter, Supply Directorate, British Raw Materials Mission.

Both the original and the present revised aeronautical steel specifications selected by the Committee include a column setting forth the SAE's Aeronautical Steel Specifications (AMS).

Use of the alternate steels listed (no longer specified as "tentative") has increased month by month, the Technical Advisory Committee reports, and in some recent months has accounted for almost one-half of the total production of alloy constructional steels for aircraft uses.

Although need for conservation of ferro-alloys has eased considerably in recent months, it is urged that conversion of alloy steel production into the NE or triple-alloy types is even more necessary than ever because stocks of ferro-alloy elements are largely tied up in the form of steel scrap—and this alloy scrap supply has increased to the point where drastic methods must be taken to prevent further increases. This composite alloy steel scrap—which contains nickel, chromium, and molybdenum in substantial amounts—is not suited to the production of the one-alloy and two-alloy steels, and in many mills alloy-free scrap is not available for production of these types.

Reading from left to right are: Eric Dudley, Airplane Division, Curtiss-Wright Corp.; N. E. Promisel, Bureau of Aeronautics; Capt. S. D. Daniels, Working Committee of Aeronautical Board; Carter S. Cole, Conservation Division, WPB; R. S. Burnett, SAE Staff; J. B. Johnson, Chief Materiels Laboratories, AAF Materiel Center, Wright Field, also chairman SAE Aircraft Materials & Processes Coordinating Subdivision; J. J. Bowman, Aluminum Co. of America; H. W. Schmidt, Dow Chemical Co.; D. G. Moffitt, British Air Commission; and B. Clements, Wright Aeronautical Corp.